# Spokane School District Case Study
# 7th – 12th Grade LSC in Science Education
# 12/15/01
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**Background:** The Spokane LSC entered its fourth year in the fall of 2001. It has had a strong focus on the program and practices in grades 7 through 10 during the first three years in anticipation of the high stakes state science assessment that will be instituted in the near future at 10th grade. The 7th – 10th grade science program has distinct chemistry, physics, life science, and earth science core units each year, has core unit learning targets tightly aligned with the state science content standards, and has core unit summative assessments designed to determine the degree of student attainment of intended learning targets. During the last two years of the project, science / technology educational "pathway" / academies are being developed in the 11th and 12th grades that will provide opportunities for further in-depth student education in areas that prepare them for post-secondary pursuits.

**Context:** The Spokane LSC was heavily "front-loaded" in the first three summers of the project (1998, 1999, & 2000) in terms of intensive professional development around program implementation, foundational subject matter background, and aligned pedagogical practices. However within the last two and half years, there has been close to a 40% turnover in secondary science teachers in the school district, and many of the newer science staff participated only minimally in the summer science institutes (summer 2000) or did not participate at all. As a result of this situation, academic year program orientation sessions (six hour sessions) for newly hired secondary science staff were conducted in the fall of 2000 and 2001, and a specially designed set of intensive grade level core unit workshop sessions was conducted in the summer of 2001. It had been intended that "new" teachers who were being hired for the 2001 – 02 school year would participate in the sessions, but because of the nature of the district hiring process, only one of approximately 12 potential teachers was able to participate. Newly hired science teachers were targeted as the principal participants, but other "veteran" science staff were also encouraged to participate if they felt they needed additional educational support.

**Summer Workshop Design**: The summer workshops consisted of four grade-level specific sessions in late June that focused on the core units that would be taught during the 1st semester of the 2001 – 02 academic year, and four grade-level specific sessions in mid-August that focused on the core units that would be taught during the 2nd semester of the 2001 – 02 academic year. Each session consisted of 10 hours of workshop instruction with approximately five hours spent on each of the core units at the grade level. The sessions were facilitated by a project staff member [project Co-PI Scott Stowell or a science disciplinary team member] and supported by a knowledgeable and "unit experienced" classroom teacher at the targeted grade level (a member of the science disciplinary or building team). Several university scientists, who are members of the

science disciplinary team, also presented segments in some sessions that supported the development of participant understanding of underlying conceptual knowledge needed to teach the unit.

The Spokane LSC has two principal themes that we believe are fundamental in supporting student learning and attainment of the intended performance standards: "teaching for understanding" and "assessment in the service of student learning". A major goal of the sessions was to have participants understand and begin to internalize these principles and actualize them in practice.

The challenges teachers previously had in implementing the core units centered on their lack of subject matter background in one of the science disciplines taught, gaps in their own understanding of certain science concepts, lack of ability to probe students understanding because of the two previous situations, lack of familiarity with some of the science and / or technology used, and inexperience in using assessment data to inform practice.

The professional development sessions attempted to address specific challenges teachers had previously had by highlighting them during the sessions, modeling approaches that attempted to resolve them, demonstrating how to conduct a demonstration or procedure, and by illustrating various problem solving approaches might be used to resolve instructional or programmatic difficulties.

The workshop sessions involved a guided "tour" of the core units, with particular emphasis placed on:

- translating the core unit learning targets and suggested instructional activities into a coherent, sequenced instructional plan;
- clarifying the underlying core unit science concepts and how they would be manifested in student work if proficient performance was attained;
- using diagnostic and formative assessment data to monitor student progress toward attainment, and to decide on appropriate intervention strategies;
- demonstrating the use of equipment and procedures involved in more "complex" lab investigations (probe-ware, CPO equipment, pre-programming videodisk segments, etc.)
- seeking input on activity design and instructional approaches based on practitioner expertise

**Case Study Design:** Six teachers, who had been involved in either one or both of the summer workshops, were randomly selected to participate in the case study. The six teachers were from five different schools. Four 7th grade and two 9th grade teachers were recruited. The case study protocol that was used involved an initial interview to obtain background information, opinions, and perspectives regarding induction and assimilation into the district science program, observation of the same science class on two consecutive days, and a post-observation interview. All the 7th grade science teachers were currently teaching the earth science unit (water – 7 to 8 weeks of instruction), one 9th grade teacher was teaching the physics unit (waves, sound, light,

electricity – 9 weeks of instruction), while the other was teaching the chemistry unit (atomic structure, periodicity, bonding, chemical structure of compounds).

**Case Study Findings:**

All of the observed teachers had participated in the district science program for at least one year, and had participated in "follow up" meetings that addressed primarily the analysis of student assessment work. All of the teachers commented on the value of working with grade level peers in the planning, organizing, and preparing of classroom lessons. The development of grade level collaborative teams for these purposes has been a goal of our LSC project, and the case study participants indicated that this was one of the most valuable aspects of the project. They felt that the open and on-going dialogue with colleagues around the teaching of the units helped them develop instructional approaches that improved student performance.

All of them also indicated that after having taught the core unit once, the summer workshops have helped them in planning for more focused instruction and helped clarify the nature of the intended student learning.

The observed teachers had experienced between 24 to 50 hours of district professional development before teaching the core units in the fall of 2001.

Based on the initial interviews, the classroom observations, and the need to focus the case study findings, the results have been restricted to one of the 7th grade teacher and one 9th grade teacher. In the two teachers classrooms that are reported on here, the efficacy of both their program instruction and use of suggested instructional activities is high.

In the case of the 9th grade teacher, she was instructing students in the behavior of light (reflection and refraction). On the first day she used an entry task (white-boarding) to review prior knowledge, and then had students participate in a lab investigation involving a sequenced series of observations and manipulations. Students worked in teams of two or three students, observing, discussing and recording data. On the second day, there was an extensive debriefing (using white-boards again) of the previous days recorded data, and explanations and interpretations were reviewed and clarified. Next day expectations were identified during the closure activity on each day.

In the case of the 7th grade teacher, her entry task reviewed information on the water cycle that had been just been completed (using the white-boarding strategy), and then elicited student ideas related to the nature of and causes of ocean tides. She built on their prior experiences and focused conversation around he expected patterns of the tides. She then had teams carry out analysis, interpretation, and plotting of tidal data (from ***Physical Oceanography*** curriculum). At the end of the first day, students completed their plotting of the data. On the second day, student teams connected plotted segments for a thirty day period and analyzed and discussed trends in the data. Conversation was then refocused on the causes of the patterns of the tidal data, and a model was used to illustrate the relative motions of the Earth and moon and to begin to explain the resultant patterns of

the tides. Closure on both days involved a review of the science ideas investigated during the days lesson.

**Implications**

Ideally , there would be a "tailoring" of the professional development to meet the needs of the instructors. In the interviews, all participants described specific areas in which they would like technical assistance. In several cases, it was in specific discipline background they needed to more effectively teach the core units at their grade level. In one other case, it was a request for a "coaching" model that would help the individual refine their pedagogical and management skills. All participants found that the building and district collaborative sessions where craft knowledge and experience of esteemed peers was shared, discussed, and processed was most valuable. The adjusted PD model would take into consideration the progressive changes in instructors' perceived needs to refine their knowledge and skills, and scaffolded sessions would be implemented to address these issues.

The challenges of implementing "teaching for understanding" and "assessment in the service of student learning" are much more complex than previously believed by the Co-PI's of the Spokane project. There are many variables that affect progress, and the path towards the desired state is anything but linear. We do know that we would focus to a much greater extent on the development of teacher leadership teams if we repeated the project again. These individuals would serve as district and building facilitators, coaches, and developers, and with appropriate cultural changes and district support, would be able to sustain the goals of the project after the NSF funding ended.