

**Teacher Research Network
Participant Profile Analysis
Elementary Science
1999-2000**

CONTEXT:

In this study there were 14 teachers/student teachers observed and interviewed. Nine of those were student teachers and five were in their first three years of teaching on the elementary level. All participants were observed teaching science lessons to elementary aged children. Two of the teachers were in their first year of teaching and two others were in their second year of teaching. The fifth teacher's years of teaching experience was unknown. The student teachers in this study were both undergraduate and graduate students completing their student teaching for initial Minnesota licensure in elementary education. Only one student teacher was completing her student teaching in a middle school setting for 4th - 6th grade. All others were in a traditional elementary school setting.

The schools in which the most participants taught ranged from small town schools to larger suburban schools in Minnesota. One teacher taught in an urban school in a city in North Dakota. The classrooms contained students of mostly Caucasian ethnicity which is representative of Minnesota students with the exception of the metro Minneapolis/St Paul area. The diversity described within the classroom setting included predominantly behavioral challenges, intellectual variation and ADD/ADHD. One child was described as deaf. Nearly all students were English proficient students.

KNOWING SCIENCE CONTENT:

The vast majority of the participants (both student teachers and novice teachers) voiced their lack of confidence in teaching science. The exception was three student teachers who were earning an elementary education degree with a co-major in science and math, and a novice teacher with an undergraduate degree in environmental science. These student teachers described their content knowledge in science as sound, and felt comfortable teaching science. During classroom observations two teachers demonstrated misconceptions about the concepts they were attempting to teach their students. Most teachers/student teachers chose science lessons in areas of their interest and comfort level. Most also chose to teach hands-on lessons using science kits (FOSS Kits). They described the lessons from such kits as "hands-on" and "inquiry" lessons.

Most taught the lessons as presented in the kits. One student teacher modified the lessons from the FOSS Kit to provide learning experiences for her students that she felt were more inquiry-based and required more higher-order thinking from students. Participants commonly equated hands-on lessons with inquiry-based learning in science. Most could not clearly define inquiry science learning, however. All agreed that hands-on activities help students learn science more effectively than the traditional lecture approach.

Although teachers/student teachers mentioned the state and national science standards, the student teachers appeared to most consistently relate the MN Frameworks to their lessons and in the interviews. This may be because it is a requirement during their student teaching, or because they were reflecting the focus of learning the standards in their university special methods classes. One second year teacher suggested that she plans and designs lessons that clearly link to the MN Frameworks in science and meet the requirements of the Profiles of Learning for the state. She appears to be a strong advocate for students learning content AND process skills in science.

Those participants least confident in their science content knowledge appeared to have the greatest difficulty relating science beyond the classroom. They also relied more heavily on the textbook for the necessary information to teach science.

Student teachers particularly voiced concern about the barriers placed on them by their cooperating teachers and/or the schools in which they were doing their student teaching. They felt that they had to teach in similar ways as their cooperating teachers, had little input into what science or how much science to teach in their classrooms, and suggested that they would do more hands-on science teaching in their own classrooms.

All participants struggled with the definitions of fact, hypothesis and theory. Many initially thought they had a good understanding of the terms, but began to question that understanding when they were asked to provide examples of each term.

KNOWING PEDAGOGY:

All participants believed that student learn well from hands-on activities. They attempted to provide such activities for their students. Student teachers easily used language that reflects current standards for effective practice in teaching science, such as constructivism, facilitated learning, guiding student learning, etc. Most participants see themselves as guides, facilitators or coaches in the classroom. However, this view was

not consistently demonstrated during the classroom observations of science instruction. Some teachers were quite teacher centered in their approach and focused on covering the material for students to learn. Many of the teachers and student teachers appeared to do a great deal of teacher telling in their instruction. It is suggested that participants' perceptions of what they are doing in the classroom differ from what is actually happening in the classroom on a daily basis.

Participants selected activities for students primarily for the purpose of engaging students in their own learning, to interest them, and to make learning science fun. Only some participants (both novice teachers and student teachers) also stated they select lessons that help students relate their science learning to the real world. Second year teachers appeared to have a clearer grasp of providing clear expectations of students and managing group work in the classroom.

Neither student teachers nor novice teachers used methods that provided them with students' prior knowledge about the science in the lessons that were observed by the researchers. Some teachers mentioned that they used the KWL method to obtain prior knowledge and to learn about students' interests, but not all demonstrated this strategy during their lessons. To some the prior knowledge seemed important to the lesson being taught, and to others it did not.

Most participants in this study stated that they kept in mind diversity among students in planning their lessons. However, observations did not reveal that they conducted the lessons in a way that took into consideration these differences.

KNOWING STUDENTS:

The participants described a broad range of understanding in knowing their students. This, in part, may be due to student teachers who are only student teaching at a particular grade level for 6-8 weeks during the semester. Most participants talked about the diversity in learning styles, intellectual diversity and differences in skills among their students. However, decisions about lesson design and implementation was not necessarily evident from observations or interviews. Some participants noted that they did not know how to modify lessons or what to expect from students who were so diverse in their abilities. Therefore, application of knowledge regarding diversity among students was lacking. Some teachers/student teachers selected group members based upon such differences and others did not accommodate for the variation.

Teachers and student teachers alike suggested that multiple forms of assessment provide accurate information about student achievement and progress. Both teachers and student teachers assessed students informally and formally. Some primarily assessed student learning through tests provided by the textbook publishers and science kits, while others designed and used rubrics, journals and presentations to assess science learning. There were varying degrees of alternative assessments apparently used by the participants in their student evaluation process. A second year teacher noted that she prefers to use performance assessment so she can see what students can do. Most teachers and student teachers felt less qualified to use alternative forms of assessment rather than traditional forms, and identified this area for further growth and understanding. Some participants recognized assessment as a means to inform them of their instructional effectiveness. Again, there was a broad range of assessment methods to evaluate student understanding and achievement.

ESTABLISHING A LEARNING ENVIRONMENT:

Student teachers felt that they were not as easily able to establish their own learning environment during their student teaching experience, and that the environment was primarily developed and maintained by the cooperating teachers.

The participants suggested that they attempted to provide an environment where students could easily ask questions, explore science ideas, discuss their understandings of concepts, and develop cooperative group skills. Some stated that they wanted the learning environment to be supportive and safe for students to take risks. Ways in which this occurred varied among the participants. Some suggested that cooperative group work was necessary, and incorporated it often in teaching science. Others maintained that students needed to do inquiry-based lessons that encouraged them to move beyond the right/wrong answer mode of learning. One second year teacher, Yolanda, stood out in that she appeared to effectively engage students in an easy dialogue with each other about their science investigations, develop their conversation skills and promote their ability to link science learning beyond the classroom. Student teachers seemed to struggle the most in developing an environment where interactions in the classroom encompassed more than students answering teacher questions.

PROFESSIONAL DEVELOPMENT:

Novice teachers took advantage of district offered staff development opportunities beyond staff meetings. District-wide opportunities differed widely, but included grade level meetings, curriculum committee participation and staff development committee work. Some teachers attended state-wide conferences to help them continue in their professional development. Some remarked that they began to develop networking with other teachers. Some suggested that taking summer school/graduate courses helped them further their teaching effectiveness. Only one teacher mentioned journal readings as a form of professional development.

Student teachers cited their special methods and college courses influenced their preparedness to teach. Their practicum and student teaching experiences were identified as helping prepare them well for teaching. They also mentioned work experiences as having had significant influence on their teaching readiness. For example, a couple of student teachers had experience coaching, while another worked at the Science Museum of MN. Older (non-traditional students) also spoke of the influence their own children had on preparing them to teach. Student teachers, as whole, had little professional development experience. This is to be expected.

There were several participants who did not apparently consider professional development important for their continued growth as a teacher. Matt stated that he felt his job was to teach in the classroom and professional development was unimportant to him. Only one teacher mentioned that parents had an effect on her professional development.

FINAL COMMENTS:

It appears that first year teachers were not unlike the student teachers observed and interviewed in this study. The second year teachers varied greatly in their confidence of science knowledge, approach to teaching, and outlook toward professional development. More second year teachers need to be included in this study to draw any reasonable conclusions about the role experience and reflection play on teacher development.

There was a wide range of detail among the profiles written for this first phase of the study. Some researchers provided a great deal of detail concerning the participant's school demographics and their content background for their degrees (undergraduate majors, minors, concentrations, etc.). This information was helpful in determining where the participants were in their confidence in teaching, teaching science, and content interests. It would have been helpful to know information

about the school size and ethnic diversity. It might also have helped to know a little about the cooperating teacher's philosophy of teaching that may have influenced not only the student teachers' ability to demonstrate their beliefs about teaching and learning, but also to determine the degree of limitations placed on them for teaching science lessons. In addition it might have helped to know the degree of university support (ie: seminars, networking, number of university supervisory visits, etc) during the student teaching process. This could play into the professional development responses during the interview process. Data about forms of assessment used by teachers/student teachers was omitted from some of the profiles. In addition, information about the professional development opportunities was included for some profiles and not others. Verification of information was missing in most profiles. It would be interesting to note where the information came from (observations, lesson plans, interviews) so that more specific data can be teased out during the analysis process.

Many questions were raised in analyzing the profiles. How can we more effectively standardize the information in the profiles without compromising the uniquenesses of the participants in the study? How can we get at the distinctions due to the added experience of second and third year teachers versus teaching philosophy variation? What can we do to tease out information about the availability of mentoring programs within the districts of new teachers, and whether they take advantage of them? What specific barriers are there to new teachers being able to teach in the way they envision teaching ought to be? How different are the various teacher preparation programs and what variation would be expected from those differences? How do the state standards play out in the classrooms of novice teachers and what effect do individual school cultures have on the degree to which those standards are implemented? It might be beneficial to gather some information from the school principals (questionnaire) to help place the teachers in a more realistic context of their schools. These are some of the questions that came to mind while analyzing the profiles submitted from the researchers. It is apparent that further study is necessary in order to make more generalized conclusions about characteristics of new and novice teachers in the state of Minnesota.

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