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Progress on Implementing Inquiry in North Carolina: Nearly 1,000 Elementary, Middle and High School Science Teachers Weigh In

Abstract

This research analyzed 977 surveys to determine the extent to which teachers report employing inquiry in their science teaching, how their use of inquiry varies by student level, and what contextual factors relate to teachers' inquiry implementation.

Introduction

Engaging students in inquiry-based science is a potentially powerful way for students to understand science-as-practice (Lehrer & Schauble, 2006; NRC, 2007). Students who gain a more meaningful understanding of the processes of science will be more prepared citizens as consumers, science enthusiasts, or civic-minded participants (Toumey et al., 2010; Wickson et al., 2010). Reform-oriented practices that include inquiry-based instruction are generally the focus of teacher education programs and teacher professional development efforts, with the knowledge that teacher beliefs and school culture and contexts are important factors contributing to the nature of classroom instruction (Barnes, Hodge, Parker, & Koroly, 2006; Demir & Abell, 2010; Fletcher & Luft, 2011; Lotter, Harwood, & Bonner, 2006).

The complex process of teaching for inquiry (Anderson, 2003; Blanchard, Southerland, & Granger, 2009; Crawford, 2007; van Zee, 2000) has turned the conversation to how to help teachers implement inquiry in their classrooms. Settlage (2007) suggests we think about inquiry as a skill-set to be developed by students and that we "abandon efforts to teach ***by*** inquiry in favor of teaching ***for*** inquiry" (p. 316), using the essential features of inquiry as a guide (see Table 1).

Keywords: inquiry, survey

Resonant with the work of Settlage (2007), Bell, Smetana, and Binns (2005) describe the basis of inquiry as a research question. They propose a four-level model of inquiry in which the complexity of the inquiry activity depends on "the level of openness and the cognitive demands required" (p. 32): 1) Confirmatory – the result is known and students are simply seeing it occur and answering questions; 2) Structured inquiry – Students investigate a given question using provided procedures; 3) Guided inquiry – Students investigate a teacher question using their own procedures; and 4) Open – Students investigate student questions using their own procedures.

We find the model of Abrams, Southerland, and Evans (2007) useful in gaining an understanding of the instructional choices teachers make, given such aspects as the students' abilities and background knowledge, contextual constraints, the goals of the instructor for inquiry, and the nature of the content to be taught. In Figure 1, the model depicts a teacher who likely is more focused on students' connecting the laboratory to material covered in class, has limited time, and/or believes her students are not ready for more open inquiry. The students in this classroom are doing a structured inquiry investigation, with a given question and procedures (Bell, Smetana, & Binns, 2005). If the teacher had more time, the teacher felt confident in having students conduct inquiry, and was focused on students developing their own research questions, these factors would push the arrows in the model upward and the level of inquiry would be open inquiry.

North Carolina's Standard Course of Study Objectives (NCDPI, 2012) were revised in 2004 to mirror the national emphasis on inquiry-based science teaching (NRC, 1996). The Next Generation Science Standards (2013) emphasize the skill and knowledge specific to scientific investigations and better explain the meaning of science "inquiry" and the range of physical, social and cognitive practices it requires. A study by Kohn (2008) investigated the prevalence of inquiry with teachers in grades 3-8 in a mid-sized school district, and found that inquiry use was moderate and dependent on class size, the amount of inquiry professional development, and the percentage of economically disadvantaged students in the school. The purpose of our study was to investigate the use of inquiry across the state and all K-12 grade levels. Teachers across North Carolina were surveyed as to factors contributing to their use of inquiry and what supported or constrained their use of inquiry. Our research questions were:

1. To what extent do teachers report preparation in inquiry and employing inquiry in their science teaching?
2. Does teachers' use of inquiry vary by student level?
3. What contextual factors do teachers indicate relate to their inquiry implementation?

Methods

The findings of this study are based on responses to a survey of eighteen items collected from 977 K-12 science

Table 1: National Science Education Standards

	Variations			
Essential Features	More	Amount of Learner Self-Direction		Less
1. Learner engages in scientifically oriented **questions**	Learner poses a question	Learner selects among questions, poses new questions	Learner sharpens or clarifies question provided by teacher, materials, or other source	Learner engages in question provided by teacher, materials, or other source
2. Learner gives priority to **evidence** in responding to questions	Learner determines what constitutes evidence & collects it	Learner directed to collect certain data	Learner given data and asked to analyze	Learner given data and told how to analyze
3. Learner formulates **explanations** from evidence	Learner formulates explanation after summarizing evidence	Learner guided in process of formulating explanations from evidence	Learner given possible ways to use evidence to formulate explanation	Learner provided with evidence
4. Learner **connects** explanations to scientific knowledge	Learner independently examines other resources and forms the links to explanations	Learner directed toward areas and sources of scientific knowledge	Learner given possible connections	
5. Learner communicates and **justifies** explanations to others	Learner forms reasonable and logical arguments to communicate explanations	Learner coached in development of communication	Learner provided broad guidelines to sharpen communication	Learner give steps and procedures for communication
	Less	Amount of Direction from Teacher or Material		More

(excerpted from Olson & Loucks-Horsely, 2000, p. 29)

educators in North Carolina. The respondents consisted of 545 elementary teachers, 221 middle schools teachers and 211 high school teachers from most school districts in North Carolina.[1] More than half of the survey participants had been teaching ten or more years, with only 7% teaching less than 2 years.

Survey Development

A committee comprised of board members from the North Carolina Science Leadership Association developed the survey items with the goal of determining progress toward using inquiry-based instructional techniques as well as the instructional constraints to using inquiry in the classroom. The data collected from the survey included five items about demographic data, ten items about inquiry use, and three open-response items.

The survey defined inquiry using the definition from the National Science Education Standards (NRC, 1996) in order to ensure a common definition of inquiry. This definition included essential features of inquiry (see Table 1) and also broader aspects:

> *Inquiry is a set of interrelated processes by which scientists and students pose questions about the natural world and investigate phenomena; in doing so, students acquire knowledge and develop a rich understanding of concepts, principles, models, and theories* (p. 214).
>
> *Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. Students will engage in selected aspects of inquiry as they learn the scientific way of knowing the natural world, but they also should develop the capacity to conduct complete inquiries* (p. 23).

Figure 1

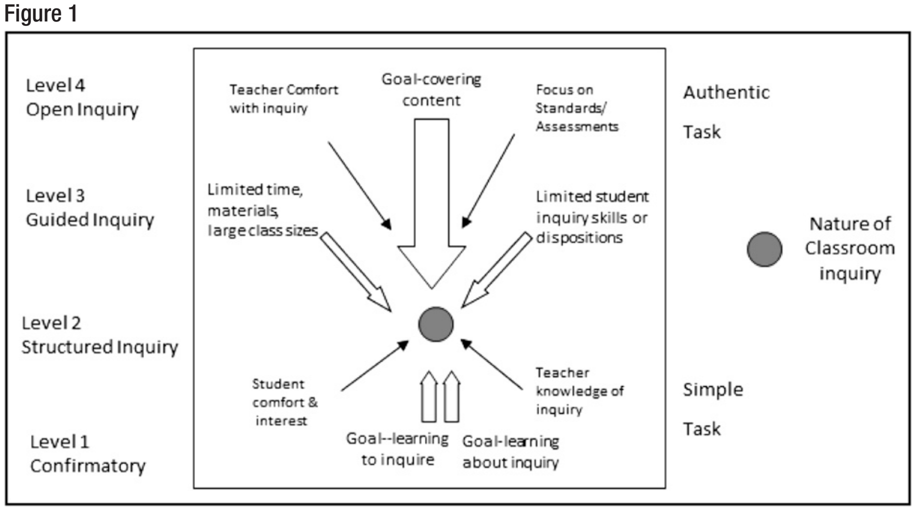

Figure 1: Select factors that shape the nature of classroom inquiry.
Note: Based on Abrams et al., 2007.

[1] When teachers were asked to indicate which level they taught (elementary, middle, or high school), teachers were free to indicate multiple levels. Teachers were *not* asked to indicate what level they were currently teaching, although this issue has been addressed for future surveys. For classification purposes, teachers were assigned to the lowest grade level they indicated (i.e., if they responded both elementary and middle grades, they were classified into elementary).

To ascertain teacher beliefs and perceptions about the use of inquiry-based instruction, items such as the following were asked using a five point rating scale:

13. How many hours per week would you teach science using inquiry if there were no constraints?
Response options: *Less than 1 hour; 1-3 hours; 3-5 hours; More than 5 hours; Not Applicable*
14. How comfortable are you with using inquiry techniques for instruction?
Response options: *Not at all; A little; Growing; Fairly Comfortable; Very Comfortable*

The survey also asked questions with open responses; these were used to qualify and triangulate the data collected. One such question was:
12. What are the constraints to teaching science through inquiry?

Survey responses were organized by grade level (elementary and middle/high). Multiple constraints in one response were segregated and coded by general topic (e.g., supplies, laboratory materials, student behavior, time, assessment, etc.) until repeating ideas were grouped together (e.g., resources) and themes (e.g., constraints related to students) emerged (Auerbach & Silverstein, 2003). To reflect trends in the data, themes were calculated based on percentage of occurrence to give a sense of how important each of the constraints was to elementary teachers, and middle and high school teachers.

Findings

Teacher Preparation for Inquiry

Elementary teachers had slightly less preparation in inquiry than middle or high school teachers (mean=2.61 vs. 2.81 on a scale of 1 to 4, with 1 being six hours and 4 being a university level course). After we controlled for number of years in the teaching profession, we found that teachers with 6-10 years of experience had the least preparation for inquiry, while teachers with 0-5 years of experience had the most experience with inquiry.

Finally, and perhaps most importantly from a policy perspective, there was a significant correlation between training with inquiry and comfort with inquiry ($r_{(981)} = 0.46$, $p < .0001$). In other words, teachers who reported having received more training in inquiry also reported more comfort with inquiry methods. As results below show, this comfort with inquiry is an important factor in actual use of inquiry methods in the classroom.

Figure 2

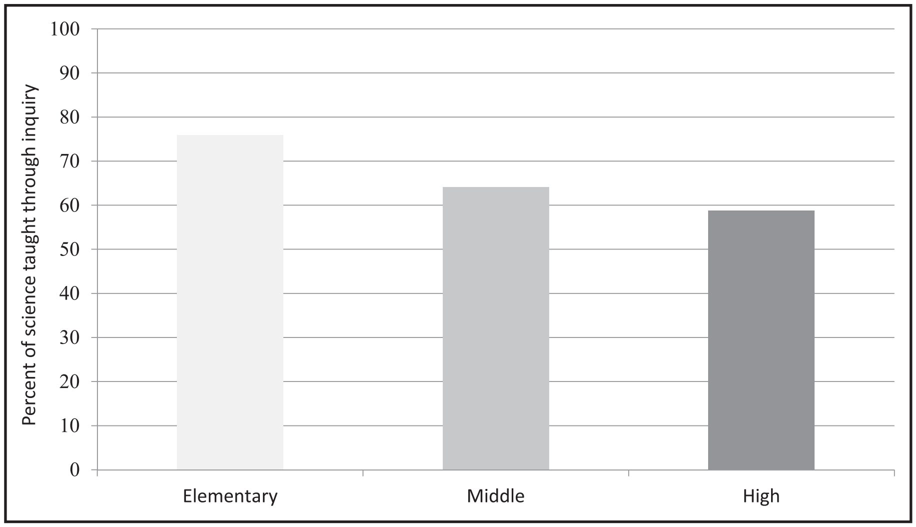

Figure 2: Percent of science teaching reported using inquiry methods.

Teachers' Use of Inquiry by Student Level

In general, teachers in elementary classrooms taught fewer hours of science per week than did teachers in middle and high school (mean= 2.68 vs. 3.80, $p < .0001$, on a scale of 1 to 4 with 1= <1 hr/week and 4= 5+ hrs/week). In looking at the percent of science taught via inquiry (according to teacher self reports), an interesting picture emerges. As shown in Figure 2, although elementary teachers report focusing on science fewer hours per week, they seem to report a larger percentage of their science teaching is done via inquiry (76% for elementary teachers vs. 64% for middle school teachers vs. 59% for high school teachers, $p < .0001$). Further, years of experience in teaching had no effect on this pattern. Unlike the teaching at middle and high school levels, science kits (which often employ guided inquiry methods) are the primary curriculum materials for inquiry-based elementary science instruction in the U.S. (Dickerson, Clark, Dawkins, & Horne, 2006; Jones et al., 2011).

This important variable (percent of science taught through inquiry, which we will refer to as %INQUIRY) deserves a bit more attention. Thus, we performed a multiple regression analysis predicting %INQUIRY from other variables, such as comfort with inquiry, training in inquiry, administrative support for inquiry, and the importance of science to the teacher and in the school. The results of this analysis are summarized in Table 2.

Table 2: Teacher and contextual variables predicting use of inquiry in teaching science

Variable	Unstandardized Regression Coefficient	Standardized Regression Coefficient	*t*	*p* <
Training in inquiry	1.46	.07	1.95	.05
Comfort with inquiry	9.08	.39	10.32	.0001
Administrative support for inquiry	0.78	.04	1.03	--
Importance of science in the school	1.32	.05	1.48	--
Importance of science for you	-8.27	-.21	-6.12	.0001

As Table 2 shows, comfort with inquiry was the single strongest predictor of utilization of inquiry, controlling for all other variables (comfort had approximately 5 times the effect of training alone). Additionally, the importance of science to the teacher was also a significant predictor of %INQUIRY, but ironically, had the opposite relationship. In other words, the more passionate teachers were about the importance of science in a personal sense, the *less likely* they were to implement inquiry, controlling for all other variables. Fortunately, this was a rather weak relationship, accounting for only about 2% of the variance in %INQUIRY, while comfort with inquiry accounted for approximately 16%.

Interestingly, although administrative support for inquiry is obviously important as a necessary condition for successfully implementing inquiry in the classroom (Yager, 2009), it is not sufficient to stimulate teachers to teach science through inquiry, as Table 2 shows. Teacher ratings of administrative support had no significant effect on use of inquiry above that of comfort with inquiry, importance of science, and training. When teachers were asked about the importance of science in the school we found no effects of this contextual variable on using inquiry in science, beyond the effect of comfort.

When asked how important science is to them, 76.4% of teachers indicated that science was *highly important*. Although simple correlations revealed that teachers who felt science was more important were also more likely to feel comfortable with inquiry, there was not a substantial effect on the percent of science taught via inquiry once the researchers controlled for other variables.

Teachers' perceptions of accountability were positively correlated with administrative support ($r = .35$) and importance of science at the school ($r = .62$), as well as with importance of science to the teacher ($r = .25$; all significant $p<.0001$). Once these factors were controlled, accountability per se was unrelated to percent of science taught through inquiry.

Revisiting importance and comfort.

There was also a significant interaction between comfort with inquiry and importance of science ($p < .02$). The nature of the interaction is presented in Figure 3. Interestingly, when teachers are *comfortable with inquiry* they tend to implement more science through inquiry regardless of personal importance of science. However, when teachers are *not comfortable with inquiry* there is a substantial difference in percent of science taught through inquiry (%INQUIRY). Ironically, those teachers not comfortable with inquiry but who place a great personal importance on science are least likely to use much inquiry in their science classes. One might speculate they are most likely to fall back on their comfort zones such as didactic methods or to see direct instruction methods as the most efficient means to present science content.

The important lesson in these data is that it is critical to assist teachers in becoming comfortable with inquiry methodology if policymakers want teachers to use inquiry in their classrooms. Merely focusing on training will have little effect if it does not improve comfort, and enhancing the importance of science for teachers may actually be counterproductive to implementing inquiry if comfort with inquiry is low. This suggests that it is important to get teachers *comfortable with inquiry* and provide scaffolding and support in training/professional development. Previous research indicates that this 'comfort' is likely to require from 35 – 80 hours of professional development, the amount of time it takes to impact teaching practices (Smith et al., 2007; Supovitz & Turner, 2000).

Elementary Teachers' Constraints to Inquiry

The 545 elementary teachers gave free responses to constraints to teaching with inquiry; in total 751 constraints were reported. Time, resources, and lack of preparation were the top concerns. Elementary teachers indicated that time (26%) is the greatest impediment to teaching through inquiry. One teacher wrote, *"We feel the need to push through the curriculum rather than allow the children to explore and discover."* When they mentioned specific aspects of time, teachers indicated that lack of teacher planning time (14%) was a major obstacle. Lack of materials was another major issue (26%) and many teachers were concerned about lack of space in the curriculum for inquiry (11%), given preparation for end-of-grade tests in mathematics and reading.

A teacher explained,

> *We have scripted programs for reading, writing, and math that we must teach and our schedules were made for us this year, which didn't leave a lot of time for science inquiry. We try to integrate it [inquiry] with other subjects and do science experiments once a week when we do not have a specialist class.*

Another teacher complained, *"Whenever the schedule is tight, science and social studies go out the window."* Inquiry was reported to be time consuming, requiring flexibility on the part of the teacher, a lot of supplies, and time for research with their students. Teachers felt they needed more preparation for teaching with inquiry, such as spending time with kits and in planning. One elementary teacher explained, *"We have not had a lot of training in order to fully carry this out. We have materials at my school, but specific training and lessons on how to make it inquiry would be ideal."*

Of the teachers' responses, 10% were blank on constraints to inquiry, either indicating they did not have any, or that the teacher elected not to complete that portion of the survey, although only 1% of the responses were *none*, suggesting that some teachers did not elect to complete that free-response item. Student factors were not often cited (6%) and, when they were, included *lack of student ability*, *background knowledge*, and *behavior* and were mostly related to the maturity level of the student.

Middle and High School Teachers' Constraints to Inquiry

Middle and high school teachers' top constraints were a lack of resources (32%), state and national standards/assessment issues (18%), time (18%) and

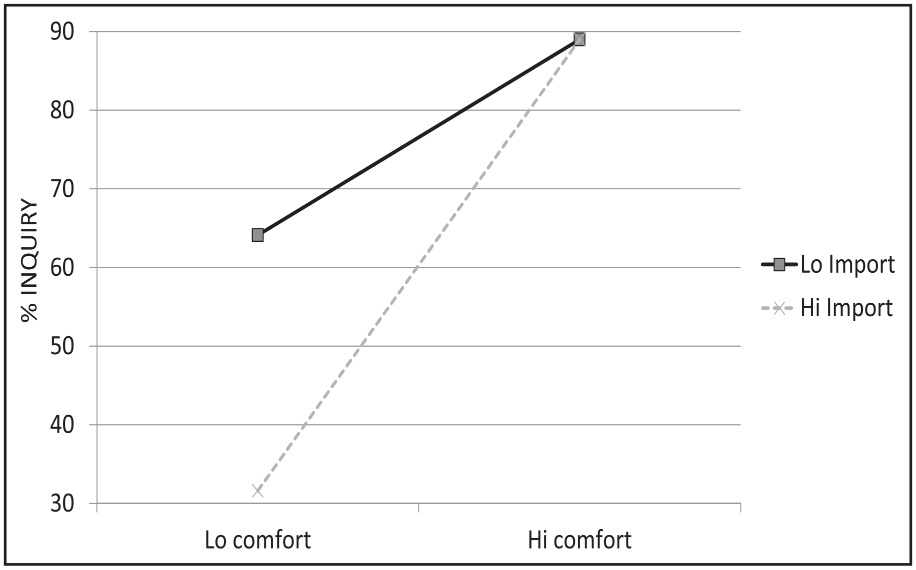

Figure 3: Interaction of comfort and importance in predicting % INQUIRY.

student attributes (14%). Time was often listed generally, but when delineated, teachers often described a lack of planning time. It was typical for multiple concerns to be listed, as did this teacher: *"Time restraints with subject matter & getting all the required materials/ chemicals, etc., not enough money in the budget. Also, having very large classes makes it difficult to do inquiry."*

Lack of resources involved lack of laboratory materials (consumables) or money to buy them, and laboratory equipment. Here is a typical comment: *"There is no money available for supplies. All money is coming out of my pocket, and I teach 95 students!"*

State and national standards were mentioned in terms of meeting many state Standard Course of Study objectives (NCSCOS), pacing guides, and high stakes end-of-course assessments. For instance, one teacher wrote: "*Most teachers feel they can't use inquiry methods when there is a rigid curriculum and inflexible time constraints placed on teachers. Requiring teachers within a district to have common tests limits the flexibility to take the time needed to do justice to inquiry."*

Time was often simply listed as such (14%), and when it was expanded on tended to include such aspects as planning time (4%) and class time (10%). A teacher explained, *"Not enough unbroken time to really allow the students to dig in and test theories; not enough time and resources to research about theories that already exist."* Other teachers commented on, *"Not having time to redo my activities to make them inquiry"* and a lack of *"Time to 'set up' for labs."*

Middle and secondary science teachers discussed student ability and/or background knowledge (9%) as a constraint. One teacher wrote, *"Students are not trained to think and few are willing to learn through inquiry. Too many levels of student ability and attention spans."* Another wrote s/he was concerned about *"student attitude & behavior; students think of it as social time,"* a concern mentioned in 5% of these teachers' comments.

Discussion and Implications

Most of the teachers who responded to this survey value teaching science. Teachers were somewhat less prepared to teach inquiry at the elementary level, and more likely to report lack of preparation (9%) as a constraint than teachers at the middle/high school level (5%). Interestingly, in quantitative analyses, teacher *comfort* with inquiry emerged as the most significant variable in whether teachers would teach using inquiry. Corroborating the findings of the survey questions, teachers did not focus on administrative concerns, interest in science, or importance of science. This seems to suggest that if teachers have comfort with inquiry and attempt to use it, then they are more likely to be faced with the other obstacles such as lack of supplies, time in the class period, planning time, or student interest/ability. This finding, in turn, suggests that providing professional development to add to teachers' comfort with inquiry is the first step to moving toward more inquiry-based instruction, rather than simply providing the materials and assuming that inquiry will follow.

Although elementary teachers taught less science than teachers at the middle and high school level, elementary teachers were more likely to teach science using inquiry-based methods. Major

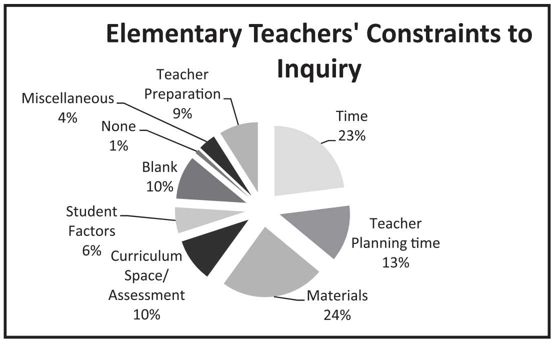

Figure 4: Elementary teachers' constraints to inquiry.

Figure 5

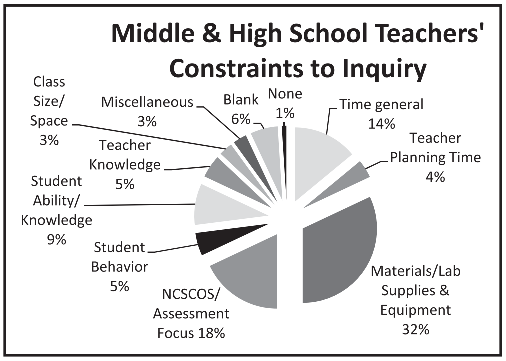

Figure 5: Middle & high school teachers' constraints to inquiry.

impediments to teaching for inquiry for the teachers at the varying levels were slightly different, but time, materials, and space in the curriculum were major foci, trumping school contextual aspects regardless of the grade-level span under study. This suggests that curricular planning at the school or district level could help teachers obtain materials and lessons that fit well into the existing curriculum. If teachers were provided training to use these resources, and provided with the necessary materials, this could increase the use of inquiry-based instruction. Assisting science teachers in this way would reduce the amount of planning needed to convert lessons into being more inquiry-based, and reduce the time consuming task of planning for and purchasing necessary consumable materials. The written responses of the teachers indicate that these teachers, at least at the middle and secondary levels, are developing their lessons individually. If this lesson-development process was assisted by curriculum planners or perhaps existing structures, such as a Professional Learning Community (PLC), it could greatly reduce the time it would take to prepare for inquiry-based lessons. We infer that it is the presence of science kits, which include lesson plans and materials all in one location and by topic, that has impacted the prevalence of inquiry-based science at the elementary level (e.g., Dickerson, Clark, Dawkins, & Horne, 2006; Jones et al., 2012).

Despite the fact that assessment did not emerge as a major issue in the quantitative data, the qualitative data collected suggests that assessment issues are frequently embedded in language about *covering course objectives* and *fitting in time for science around other tested subjects*, both of which relate directly to assessment practices. The fact that assessment was not highlighted implies these items on the survey may need revision. It is clear from the open response items that assessment drives instructional choices, and limits the use of inquiry-based instruction in these science classrooms.

The Next Generation Science Standards (NGSS) have refined inquiry based science using eight science and engineering practices (NGSS, 2013). The focus is on the interconnected nature of scientific fields and real world connections.

"The framework is designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields" (The Framework for K-12 science education: Practices, crosscutting concepts, and core ideas, 2011, p. 10). Given that the framework focuses on actively engaging K-12 students in scientific and engineering practices, its adoption by states ought to promote the use of inquiry-based instructional methods.

Recommendations

We were pleased with the progress on inquiry implementation in the state. Interest in science was high among our survey participants, and contextual obstacles at the school level seemed minimal. Our study suggests that to continue progress with teachers' inquiry, we keep in mind that teachers are most likely to use inquiry if they are comfortable with it (see Figure 6). Therefore, we recommend that teachers gain access to high quality inquiry experiences, such as those that provide a clear model of inquiry, include teacher reflection, meet standards, and fit into the existing curriculum, timeframes, and other school logistics (e.g., Blanchard, Southerland, & Granger, 2009).

Next, since materials, laboratory equipment and lessons are also obstacles, we suggest the use of kits at the elementary level and more centralized planning for and provisions for materials for middle and secondary science teaching of inquiry, to lessen the time demands. Experiences with kits and common planning could take place during meetings of professional learning communities (PLCs) or during time for teacher in-service training. Given the high stakes of assessment that pushes out science at the elementary level, we suggest science kits that integrate mathematical concepts and reading in order to make time for science. We also wonder if assessing science at the elementary level would increase the teaching of science. At the secondary level, there is more work to be done on

Figure 6

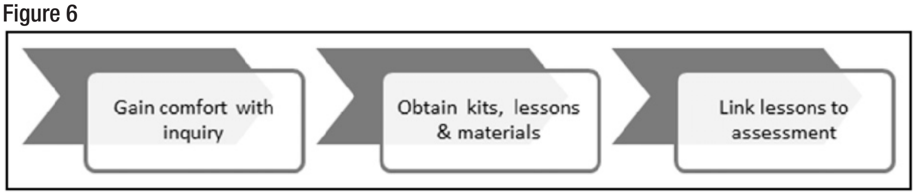

Figure 6: Factors to increase the use of inquiry-based instruction.

the impact of inquiry-based instruction on the learning of content. One recent study indicated that inquiry-based learning has the potential to increase content learning and learning of the nature of science, especially with students in high poverty schools (Blanchard et al., 2010).

Future research could investigate:

- Science end-of-course and end-of-grade tests (EOCs & EOGs in NC) to see if schools (LEAs) or teachers implementing inquiry increase student performance (using data from the North Carolina Department of Public Instruction (NCDPI) or the relevant state)
- Best professional development to facilitate long-term use of effective inquiry
- Effect of inquiry training on retention in the profession and professional satisfaction (via a teacher survey)
- Whether schools under threat of punitive action from state regress toward more traditional pedagogies
- Effect of teacher inquiry use on student retention, interest in STEM courses and careers, engagement in school, educational plans, etc. (using state data)

Limitations

Teachers were invited to participate in the study. Therefore, the survey participants may not represent what all science teachers believe, but rather those who preferentially focus on science at the elementary level or those who find inquiry challenging and, therefore, were inclined to respond. Our best guess is that we have teachers who are more "science friendly" than is typical.

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Appendix A

NCSLA Science Inquiry Survey

All teachers in North Carolina's public and private schools are invited to participate in a brief survey on science instruction. Science education leaders are encouraged to solicit participation from the teachers is their district. Please be sure to complete the survey by October 11, 2010.

For the purposes of this survey, we use the following definition of inquiry:

Inquiry is a set of interrelated processes by which scientists and students pose questions about the natural world and investigate phenomena; in doing so, students acquire knowledge and develop a rich understanding of concepts, principles, models, and theories.

Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. Students will engage in selected aspects of inquiry as they learn the scientific way of knowing the natural world, but they also should develop the capacity to conduct complete inquiries.

National Science Education Standards, www.nap.edu/html/nses

Our goal is to develop a large database of information that will be useful in making instructional and policy decisions at both the state and local levels. Results of the survey will be shared through the NCSLA newsletter and website. In addition, results will be disaggregated by school district and sent to the superintendents and curriculum supervisors for each district.

Your responses are intended to be anonymous; please feel free to omit any information that you feel would jeopardize your anonymity.

1. School District ___________________________

2. What kind of position do you currently hold?
    - Teacher
    - Building Administrator
    - District Administrator
    - University/College
    - Other

3. How many years have you been a classroom teacher?
    - 0-2
    - 3-5
    - 6-10
    - 10+

4. What kinds of formal training have you had in regard to inquiry?
    - 6 hours or less
    - 2-4 days
    - 5 days or more
    - At least one university level course

5. Subjects/grade levels taught.
    Please check all that apply.
    - Elementary/PreK general
    - Elementary/PreK science
    - Elementary/PreK mathematics
    - Middle school mathematics
    - Middle school science
    - High school mathematics
    - High school biology/life science
    - High school chemistry

High school physical science
High school physics/astronomy
High school earth/enviro-science
Support personnel (no students of your own)
College

6. Rate the level of administrative support you receive for inquiry instruction.
   - None
   - Little
   - Fair
   - Good
   - Excellent

7. How important is science at your school?
   - Not at all
   - Slightly
   - Growing
   - Average
   - Highly Important

8. How important is science to you?
   - Not at all
   - Slightly
   - Growing
   - Average
   - Highly Important

9. What is the level of accountability for teaching science at your school?
   - None
   - Little
   - Growing
   - Average
   - High

10. How many hours per week do you teach science (or is science taught in the school(s) you work with)?
    - Less than 1 hour
    - 1-3 hours
    - 3-5 hours
    - More than 5
    - Not Applicable

11. How many hours per week do you teach science using inquiry?
    - Less than 1 hour
    - 1-3 hours
    - 3-5 hours
    - More than 5
    - Not Applicable

12. What are the constraints to teaching science through inquiry?

13. How many hours per week would you teach science using inquiry if there were no constraints?
    - Less than 1 hour
    - 1-3 hours
    - 3-5 hours
    - More than 5
    - Not Applicable

14. How comfortable are you with using inquiry techniques for instruction?
   - Not at all
   - A little
   - Growing
   - Fairly Comfortable
   - Very Comfortable

15. In what areas related to inquiry would you like to have training?
   - Formative Assessment
   - Summative Assessment
   - Classroom Management
   - Integration of literacy with science inquiry
   - Designing/structuring inquiry lessons and units
   - Other

16. If an online professional development course about science inquiry, or other science topics were available in your school, district, or state, how likely would you be to participate?
   - Not at all
   - Possibly
   - Probably
   - Definitely

17. If you could choose a science related distance-learning course that would be widely used in your school or district which topic would you select?

18. If you were offered the training to become an effective online instructor, how likely would you be to teach online professional development courses to other teachers in your school or district?
   - Not at all
   - Possibly
   - Probably
   - Definitely

Any other comments you would like to share?