Collaborative Inquiry to Make Data-based Decisions in Schools

Douglas Huffman, University of Kansas

Julie Kalnin, University of Minnesota

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Abstract

The purpose of this study was to investigate the impact of a long-term collaborative inquiry project for diverse teams of teachers, administrators, school board members, and parents. The teams engaged in collaborative inquiry to collect and analyze local data to make data based decisions about how to improve teaching and learning. The results suggest the collaborative inquiry not only positively influenced the teachers, but also helped them engage in a continuous improvement process that allowed them to take more ownership over local data and expand their role in their schools' decision-making processes.

Introduction

All too often teaching is an isolating profession. It's ironic that new teachers enter the profession because they like to work with people. Instead of collaborating with other teachers and working together as a team to help educate students, many new teachers end up alone in their classroom feeling a sense of isolation (Easley, 2000; Sandholtz & Dadlez, 2000; Slater & Trowbridge, 2000). Numerous studies have shown that teachers have very little time during the day to work with other teachers, plan lessons as a team, or even talk with their colleagues (U.S. Department of Education, 1996). In the Third International Mathematics and Science Study it was found that in the U.S. approximately fifty percent of the middle schools had an official policy on

collaboration; however, only twenty percent of math teachers observed another teacher during the school year, and less than ten percent of math teachers met with other teachers during a typical week. It is not surprising that such limited interactions with one's colleagues would lead to feelings of isolation.

One way to help address the isolation experienced by many teachers is to engage teachers in meaningful professional development where they can interact and collaborate with their colleagues. The National Research Council recently published such a professional development program called, Global Perspective for Local Action: Using the TIMSS Data to Improve Math and Science Education (NRC, 1999). The program was designed to help teams of educators from a school district collaborate in a long-term process of investigation, reflection, and planning. Reducing isolation for teachers was one aim. The overarching goal was to create district teams that involved teachers, administrators, and sometimes parents in collaborative inquiry to help produce local action in their own schools. Each team selected a focus for their study and collected data in their own school to ultimately make data based decisions about how to improve teaching and learning. The professional development program was designed to help the teams collaborate in a shared process of continuous improvement and data based decision-making.

Individual teacher inquiry, reflection, and data-based decision making in the form of action research/teacher research projects have been shown to be powerful tools for influencing an individual's beliefs and theories of teaching (Bissex, 1994; Cochran-Smith & Lytle, 1993; Kalnin, 2000). Noffke (1997) establishes that action research/teacher research projects have personal, professional, and political purposes and benefits for teachers. Though individually

conceptualized inquiry efforts may have substantial benefits for a teacher's learning, critics raise questions about whether such projects have any systematic impact on school change efforts (Elmore, 2000; Corcoran 1995). In fact, Elmore claims that if teacher researchers do not move toward collaborative designs addressing whole-school or district issues their work will amount to no more than "playing in a sandbox" (Elmore, 2000). In contrast, professional development structures that engage teachers and other educational personnel in joint investigations create opportunities to share expertise and build interdependence in understanding instructional issues within a particular institutional context (Elmore & Burney, 1999; Fullan, 1993; Little, 1999; Sarason & Lorentz, 1998).

Approaching inquiry from a collaborative, team-based approach also potentially addresses the organizational structures in schools that have hampered school change efforts. Sarason (1996) urges that districts and universities create opportunities for collaboration that move across current hierarchies in order to improve student achievement. He concludes, "Teachers cannot create and sustain contexts of productive learning for students if those contexts do not exist for teachers" (p. 253-254). Elliott (1991) specifically identifies inquiry-based efforts as critical to a restructuring of roles:

> Action research integrates teaching and teacher development, curriculum development and evaluation, research and philosophical reflection, into a unified conception of a reflective educational practice. This unified conception has power implications inasmuch as it negates a rigid division of labour in which specialized tasks and roles are distributed across hierarchically organized activities. (Elliott, 1991, P. 54)

Collaborative research projects such as those fostered by the *Global Perspectives for Local Action* program engage individuals from many positions in a district in a shared mission of data-gathering and analysis designed to inform teaching practices and support school change. These collaborative efforts, by recognizing the collective nature of educational understanding, support the participants in building contextualized knowledge of their students and community. Cochran-Smith & Lytle (1999) describe such collaboration as essential to developing knowledge about teaching and learning. They contend, "Knowledge emerges from the conjoined understandings of teachers and others committed to long-term highly systematic observation and documentation of learners and their sense making" (Cochran-Smith & Lytle, 1999 p. 275). *Global Perspectives for Local Action* program sought to initiate such a forum, where investigation into substantive issues of math and science education could take place within and across districts and with university-based science educators.

The Inquiry Process

Teams of educators from across the State of Minnesota participated in a year-long series of workshops designed to help teams engage in inquiry in their own schools. The teams were comprised of diverse members from public school districts. Teams included elementary, middle school, and high school math and science teachers, principals and superintendents, curriculum and assessment coordinators, and in some cases even school board members and students. Eight teams participated in the seminar with from four to eight people on each team for a total of forty-two participants. The TIMSS seminar was designed around the principles of professional development recommended by Loucks-Horsley, Hewson, Love and Stiles (1998). As

recommended, professional development should move beyond basic awareness and knowledge building, and help teachers actually translate their knowledge into practice, encourage them to make innovations in their teaching, and to reflect deeply on teaching and learning. All too often teachers attend short one-shot workshops that have limited impact on their practice. The collaborative nature of the TIMSS seminar-- along with the long-term follow-up once teams went back to their schools--was designed to help districts create some lasting impact in their schools

The catalyst for the inquiry process was the Third International Mathematics and Science Study, also known as TIMSS. TIMSS was the largest and most comprehensive international study of curriculum, instruction and achievement in science and mathematics ever conducted (U.S. Department of Education, 1996). The main data sources for the TIMSS were teacher and student questionnaires about their mathematics and science classrooms, teachers' and students' backgrounds, class activities, perceptions of science or mathematics education, the use of different teaching techniques, and the topics taught in math and science. In addition, the students completed achievement tests in both mathematics and science. The TIMSS was conducted in over 50 countries worldwide at three different grade levels: elementary (3rd and 4th grade), middle school (7th and 8th grade), and high school (12th grade).

In the United States, the State of Minnesota participated in TIMSS as a "mini-nation" and as such has data that are separate from the rest of the United States. Educationally, Minnesota's public schools are viewed positively and student test scores have historically been some of the highest in the United States. On the TIMSS achievement tests Minnesota scored above the U.S.

mean in both science and mathematics at all three age groups that were tested. Despite the strong showing for Minnesota relative to the U.S. mean scores, when comparisons are made between Minnesota and other countries the results do not appear nearly as positive. In science, the 4th and 8th grade scores were tops in the world with only Korea scoring higher at the 4th grade level, and Singapore scoring higher at the 8th grade level. However, by the 12th grade science scores were near the international average. Scores on the mathematics portion of TIMSS were even lower than science. At the 4th, 8th and 12th grade levels students scored at or near the international average in mathematics. Many countries scored significantly higher than Minnesota including Singapore, Korea, Japan, and Hong Kong.

In order to examine issues of curriculum, instruction and achievement, and to look closely at the less than positive result for Minnesota, the TIMSS Seminar started with a two-day workshop to examine the U.S. and Minnesota TIMSS results. The seminar also helped teams begin the inquiry process by identifying questions about their own mathematics and science programs, and developing initial plans to collect data in their own schools to help answer the questions they generated. Throughout the following year, teams were brought back together periodically to analyze their data, develop action plans, and to create long-term continuous improvement systems.

The over-arching focus question for the initial two-day workshop was: "How can information from TIMSS help you make changes in practice that will promote student achievement of our Minnesota Graduation Standards?" The school district teams were instructed in how to use an

eight-step action-research process outlined by the NRC in the professional development manual (NRC, 1999). See figure 1.

The first step in the process was learning about TIMSS. Comparing the Minnesota TIMSS results to national and international results was particularly helpful in engaging Minnesota teachers in the TIMSS data because they could relate to the results. In this stage of the inquiry cycle the teams explored the TIMSS data by examining charts of results from the teacher, student and principal surveys. Three different sessions were held on curriculum, instruction and support systems. For the curriculum exploration teams spent over two hours examining graphs of Minnesota and U.S. results regarding topics taught, courses offered in schools and time spent on different topics. The emphasis was on exploring the data and attempting to brainstorm questions that arose from the charts. The TIMSS results seem to produce more questions than answers, and as a result they served as a fertile starting point.

The next exploration session focused on instruction. In this section, the teams of educators watched the TIMSS videotape of mathematics teaching in U.S. and Japanese classrooms (U.S. Department of Education, 1996). Using more of a constructivist model of instruction, the teams were first asked to make predictions about what they think they would see in a typical U.S. and Japanese classroom, and then after observing the videos they compared their predictions to what they actually observed. As a follow-up teams read an article on the videotape study (Stigler & Hiebert, 1998). The teams also explored more graphic representations of results from both the U.S. and Minnesota TIMSS (Lawrenz, Huffman, Palmer, 1999).

During the support system session the emphasis was on exploring professional development. Teams watched the videotape called "The Secret of Trapeze" and read about research lessons in an article by Lewis and Tsuchida (1998). The goal was to engage the teams in expanding the role of professional development and ways to increase collaboration between colleagues in schools.

At the end of the two-day seminar the teams developed a research focus that would guide them during the upcoming year. The exploration of TIMSS data raised many issues and questions for the teams. They were asked to choose one issue or question as the focus for their research. Most teams focused on issues of curriculum or instruction. For example, one team chose to map the K-8 science curriculum to better understand what was being taught in each grade and the relative emphasis on each topic. Another team focused on ways to improve the math scores of minority and under-represented students, while a third team compared the math performance of students who took a traditional math course to students who took the new reform mathematics program. Overall, most teams ended up surveying teachers about how they taught math or science because few districts had data about the instructional methods teachers used in the classroom.

The teachers used the summer after the TIMSS workshop to analyze the data they collected, and then in the fall the teams came back together for a follow-up session where groups shared results. Based upon what was learned over the summer, teams focused on a specific problem that was identified through their data analysis. They then developed action plans to address the problem they had identified. The action plans required continuous monitoring, data collection, and analysis. This in turn generally led to more questions, more data, and more research. In the end

the goal was to help teams establish a continuous improvement and inquiry cycle that would continue into the future.

Example Inquiry: The "E-Team"

One team in the seminar decided to focus on better understanding teachers' views of elementary math teaching. They formed what they called an "e-team," which stood for "Elementary Mathematics Research Team". The team included three elementary teachers and a parent. One of the teachers was a veteran teacher with a background in mathematics. Their focus was similar to other teams who also focused on better understanding mathematics instruction. After watching the TIMSS videotapes of mathematics teaching in Japan, and examining the TIMSS survey results, it was their initial belief that their teachers were not using the reform methods to teach mathematics. However, they did not have any local data to support their claims about their own teachers' pedagogical methods. As a result, they decided to survey their elementary teachers to find out what they believe about mathematics and how they teach it. They collected survey data from their elementary teachers about how they taught mathematics. They used items from the Local Systemic Change project (Horizon, 1997) and the TIMSS teacher surveys. These items focused on how often teachers used various instructional strategies when they taught mathematics. Included were questions about the use of more reform methods such as having students engage in hands-on activities, participate in inquiry-oriented activities, gather and analyze data, and work on problems with no immediate solution. Also, included were questions about the use of more traditional methods such as having students practice computations, watch the teacher do problems at the board, individually practice problems, and complete worksheets. Teachers were asked to rate the items on a four-point Likert scale.

The e-team reported that their teachers "lacked a common vision about how to teach mathematics." Through discussions with the elementary teachers it was clear the teachers believed in the reform ideas. However, according to the survey results traditional techniques such as practicing computational skills and working individually on problems were more common than using investigative approaches to teaching mathematics.

As a next step, the e-team mapped the K-6 mathematics curriculum. Through the mapping process they were able to establish essential focus areas for each grade level. The e-team also gathered and prepared some model units to help provide teachers with actual units that incorporated reform methods of instruction. To help spread the word about the project, the e-team also organized a parent night to build community support for their changes. All of these efforts combined helped the e-team build an atmosphere supportive of thinking about mathematics instruction in their three elementary schools.

For the first time since these teachers could remember, the school was discussing issues of mathematics instruction, and how best to teach it. They were also debating the relative merits of different mathematics topics, and the extent to which they should be included in the curriculum. They faced teachers and parents who disagreed with the reform methods and preferred a more traditional approach to mathematics that focused on computational skills rather than math thinking and problem solving, but even in the face of disagreement their emphasis on data-based decisions and arguments refocused the debate onto evidence to support decisions about teaching, rather than just opinion. In the end, this was a very different debate. In one year the e-team was

able to refocus the discussion and get teachers, principals, and parents talking about how mathematics should be taught. As the team looked to the future as the project drew to a close, they reported their intention was to keep pushing forward, spreading the word throughout the district, and supporting teachers as they attempt to integrate more reform methods into their classes.

Survey Results

The impact of this approach to encouraging data-based decision making was documented through both surveys and a focus group held with the participants. At the end of the year, twenty-nine of the forty-two participants completed a survey regarding their experience and their perceived impact of the inquiry process. The survey was administered by the authors on the last day of the workshop. The survey was developed by the authors to examine the perceived impact of the project on participants. The items were drafted, and reviewed by both program staff and science educators at the University. While there is a concern that program participants tend to complete surveys in an overly positive manner, surveys can still provide valuable indicators about program impact (Patton, 1997). The conservative approach is to assume that the actual impact is slightly less than perceived impact.

The survey results suggested that the vast majority of participants agreed that the seminar had a positive effect on them personally. For example, over 90% of the participants agreed that the seminar was a valuable experience, increased their awareness of TIMSS, increased their collaboration with colleagues, and improved their classroom teaching. The majority of

participants also agreed that the seminar altered their philosophy of education and helped them improve their ability to conduct research. See figures 2 and 3.

In terms of the impact of the seminar on the schools themselves, over 80% of the participants believed the seminar improved their curriculum, instruction and their school district in general. The process clearly helped them reflect deeply on teaching and learning and to alter the way they think about math and science. Most importantly over 95% of the participants believe the process helped their school district use data to make decisions and to engage in a process of continuous improvement. See figures 4 and 5.

As is evident from these results, the survey indicates the general impression of participants was that the project had a positive impact on a broad range of dimensions. The data, however, cannot give a full picture of the degree of the impact or of the factors that may have interacted with project efforts to strengthen or weaken that impact. To elicit more in-depth responses, participants were engaged in a focus group discussion of these issues (Krueger, 1988).

Focus Group Results

The focus group included 9 individuals who had participated in the year-long inquiry process. Each of the eight teams was asked to send one representative to the focus group, and in addition one larger team sent two representatives for a total of 9 people. The purpose of the focus group was to better understand how the inquiry process and the TIMSS workshop experience affected individuals; both personally and professionally, and how it affected their school and district. Focus group responses to individual questions were organized into these categories.

The focus group began with a question about how the process of engaging in research and attending these workshops affected them personally. Responses focused on both practical effects and on general feelings of professionalism. For example, one focus group member thought the process made her more informed about science, and this, in turn helped her in the classroom with individual teaching techniques. One group member said the process provided practical assistance by helping the team in their curriculum review process, through introducing new ideas and creating networking opportunities. Others reported that they had wanted to take a new direction and the process, by helping them reflect, supported their experimentation.

Beyond the practical impact, the consensus of the group was that participating in the project strengthened their feelings of professionalism and heightened their professional standing. Through studying the TIMMS data, they felt more engaged in current professional issues: "I felt more a part of it -- TIMSS that was recently on the news -- connected me to a broader sense of education outside my classroom." All agreed that being associated with the project strengthened their position as professionals in their districts and within the community. One group member stated that the process help provide solid evidence regarding initial feelings the team had about why something was not working in their schools. One teacher said that she "feels like an island." "The department cares, but wants to teach the easy way. TIMSS provided support to teach differently." Although team members were all ready to dive in at the beginning, the process worked to slow them down, and to focus on a clear direction. In doing so, members stated they were able to collect data that provided evidence to support their beliefs. By taking an investigative position, questions about teaching practice became a "system" issue rather than a

personal one. As a result, the team found that their colleagues didn't get defensive. The team's representative stated that they could approach their staff with the message that "We'll collect information on the issue and take a careful look at results before jumping to any conclusions." Similarly, another team said their administration is rather "top-heavy" and participating in the project helped inform the "bottom" and has given teachers credibility in making recommendations to administration.

One group member from a different team reported a similar effect on the team's interactions with community members. This person stated, "There are lots of opportunities to be trained, but hard to transfer into practice. This process was different in that the teachers felt they were part of a research group with State Department of Education. They were sponsored by something bigger and it gave more status to their surveys and research. Other representatives believed that the process helped the teams develop a much greater awareness of the role of parents and the community in reform. This team is now working to enact community change. Their team members are also more informed about issues in math and science education and can now serve as advocates.

In spite of the significance of the perceived benefits, participants also expressed considerable frustration with process--something the survey did not capture. The most common difficulty identified by the participants was the struggle to do research and teach at the same time. One group member said she had previously considered herself a "doer" not a planner. Doing this research really forced her to bring all the planning pieces together. On a broader, collegial level, as teachers blended the researcher and teacher roles, they reported encountering conflicts with

current norms among teachers and administrators. One representative stated that this conflict led the team to look at a different model of teaching. This team and others reported that finding ways to create time to meet and discuss as a team within the district was essential to allowing teachers to take on new responsibilities. Teacher participants also stated that the negotiation shifted their perceptions of teachers' roles within the traditional school hierarchy. “We’re a team from the ranks not from above,” commented one participant. Another group member said they are now much more data conscious. They now ask, “Where’s the research to back-up” this new curriculum or new teaching idea. In essence, the frustrations that focus group participants expressed highlighted the ways in which participating in research led teachers to participate in their schools in ways that did not always fit easily with the traditionally identified job responsibilities of a teacher, or into the current structure of the school.

These tensions were mentioned again when focus group participants were asked to discuss how the inquiry process had affected their schools. In line with individual's comments about the impact on their professionalism, one team said the process of participating in the workshops and conducting research had improved the leadership skills of the teachers on the team. They saw the teachers acting as leaders in their curriculum area thanks to engaging in actual research in their schools. The process is so unique, they believed that it had opened doors in the schools and caused other teachers to look to them as leaders.

Another team stated that although they saw a positive school-wide impact as well, that they saw their progress as only in the “infant stages.” This team was particularly concerned, their representative stated, in making sure they had their data together before trying to change the

school. They had found that many people at the school were nervous about using a new math curriculum developed through National Science Foundation funding. These teachers had all been raised with traditional math and the team understood that significant professional development would be necessary to support their colleagues in using the new materials. The team planned to initiate this process by investigating the impact on elementary students so they could present evidence about how the new methods affect students.

Finally, the group commented on various aspects of the process that facilitated or challenged their research. One team emphasized the importance of a supportive principal. Others mentioned the continuous nature of the process and how important that was to facilitating their research. The initial fervor that goes with any new innovation usually diminishes, participants asserted, but in this case they observed that interest stayed high because the process always generated new data, and thus, new questions. Everyone seemed to remain optimistic. Participants agreed that the seminar was helpful in providing time to connect and meet--time that they had previously described as scarce and hard to come by in their day-to-day work. The seminar was also mentioned as being important because it provided participants with access to information resources and materials, as well as opportunities to connect with a variety of people. Interacting with other schools and school districts was mentioned as a particularly important part of the seminar. They stated it was helpful to hear different ideas and the progress made by other schools that were in a similar situation.

When describing barriers to the process, the most general concern was how teams were to carry out the work of the project independently once the series of workshops ended. One team

reported, for example, that--in spite of the reports of enhanced professionalism described above--they did not have the authority to get the work finished. The team was uncertain about how to move reforms through the curriculum committee or through the administration. They asked for a letter from the state department of education to their administration as a way to legitimize further the work they had accomplished during the project. Another thought of themselves as a small "rash" and they intend to spread to other people whether they liked it or not.

Finally the focus group was asked about next steps and what they intended to do in the future. All of the teams indicated they want to align their mathematics and science curriculum to insure everything is being covered given that their data collection showed there are some gaps. They also want to look at using some new instructional practices. Some would also like to develop a continuous improvement process that they could apply to other areas. For instance, one team reported that the process made them think differently about their role as subject-area specialists. This team came with a math focus, but learned about science education. They reported learning how the inquiry process could help them in any subject area.

Overall, the teams described a variety of ways this process has affected them. The group did not describe as many personal impacts, but they were able to describe many ways that the process has affected their schools. It is clear that the group had a positive reaction to the whole process. They see that they are only just beginning to enact reform in their own schools, but at the same time they seem to feel like this process has helped to create a firm foundation, unlike many workshops that are one-shot events without much lasting impact. This series of seminars that engaged team members' participation seems to have helped the teams change the way they

operate in the schools. Some have taken on more leadership roles as they work on spreading reform. The research-based approach seems to have contributed to the team's credibility back home because they were actually collecting data about their own setting instead of bringing back the advice of an educational expert. The research-based approach appears to have changed the teams in ways they did not expect, and has helped the teams initiate movement towards more lasting, meaningful reform in their own schools.

Discussion and Implications

It is the authors' belief that we must increase collaboration in our schools. Collaboration is essential for not only reducing the isolation of the profession, and for enhancing individual teacher's professional growth, but also for the impact it can have on schools and students. Participants in the seminar reported that the team-based approach to inquiry that was used in this project had an impact on both individual teachers and on the schools. For the individuals, it appears the process increased their knowledge of teaching, altered their philosophy, improved their teaching, and increased connections with other educators. Significantly, there is also evidence that this collaborative inquiry process impacted the schools. It appears to have helped the teachers get beyond their own classroom walls and begin to at least discuss and debate school-wide issues. The participants stated that the process helped their districts engage in continuous improvement by using data to make decisions, altered the way others think about math and science, and ultimately improved student learning. There was no direct measure of impact on students in this study, but the participants did indicate that they believed it had--or will have--an impact. They believed it helped them implement more reform methods and hence improve student learning. The focus group results help to qualify the strongly positive results of

the survey by providing a more realistic picture of the process of inquiry and collaboration. While the teachers believed they are having an impact in their schools, they also realized they are in the early stages and that having a larger impact will take time and perseverance.

The benefits of this collaborative inquiry process correspond to what other researchers have found (Elmore & Burney, 1999; Little, 1999; Sarason & Lorentz, 1998). However, one important finding to emerge from this study of collaborative inquiry is the way in which the teachers made the inquiry process their own. All too often, professional development workshops do not have lasting impact on schools. It is difficult for teachers to retain the initial excitement and to bring things back to the classroom without ongoing support and reflection. The TIMSS workshop was able to overcome this problem by slowly engaging teachers in a long-term data collection and analysis process. The inquiry prevented a rush to action, by allowing the teachers to carefully collect local data and thoroughly analyze them before developing an action plan.

We believe that the intentional juxtaposition of global and local focus contributed to the participants' developing this sense of ownership. Examination of the original TIMMS data encouraged substantive conversations among team members about the interactions between structural and instructional factors that may affect mathematics and science achievement. These conversations allowed participants to probe the data theoretically, and to raise questions about the implications of the TIMMS analysis. Posing these questions positioned the teams to bring what they had learned about the international dimensions of math/science learning into their local context. The theoretical aspects of reform-based science and mathematics instruction thus provided a framework for shaping a focused inquiry. "What does this issue look like for our

district? What exactly is happening here in relation to this dimension of the TIMMS data?" This contextualization is critical for educators and is often neglected. Through their collaborative inquiry, district teams effectively created a dialogue between the findings of a major research study and their own inquiry. This dialogue potentially supported them in more deeply understanding the TIMMS research itself as they came to understand a dimension of the study through their local data collection and analysis. While relationships between research and practice are often described as a process of transfer or implementation, the TIMMS seminar illustrates how the process may be more one of reconceptualization or recontextualization that allows participants to integrate research and practice. This integration--created over time through collaborative inquiry-- supports informed action.

The participants' ability to take ownership of the issues was the most critical feature of the inquiry. The teachers collected their own data, rather than only looking at the results of a research study conducted by experts. In a very real sense, the data was their own, as was the solution. Data helped break the cycle of isolation. Data helped break down the barriers faced by teachers. Data helped the teachers critically inquire about teaching. Data helped focus on evidence-based decisions. More importantly, teams began to see that when they control data they can shape the debate. They came to see that what they do in the classroom really does matter and that they can determine outcomes through their own actions. Engaging in the process of inquiry, albeit frustrating and time consuming, was engaging, and provided the teachers with the ability to move beyond their classroom walls and begin to examine school-wide practice. Data were a catalyst for change that allowed the teachers to collaborate with their colleagues,

engage in professional debates about teaching and learning, and break the sense of isolation felt by all too many teachers.

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Figure Captions

Figure 1. Inquiry Cycle used in the TIMSS Seminar.

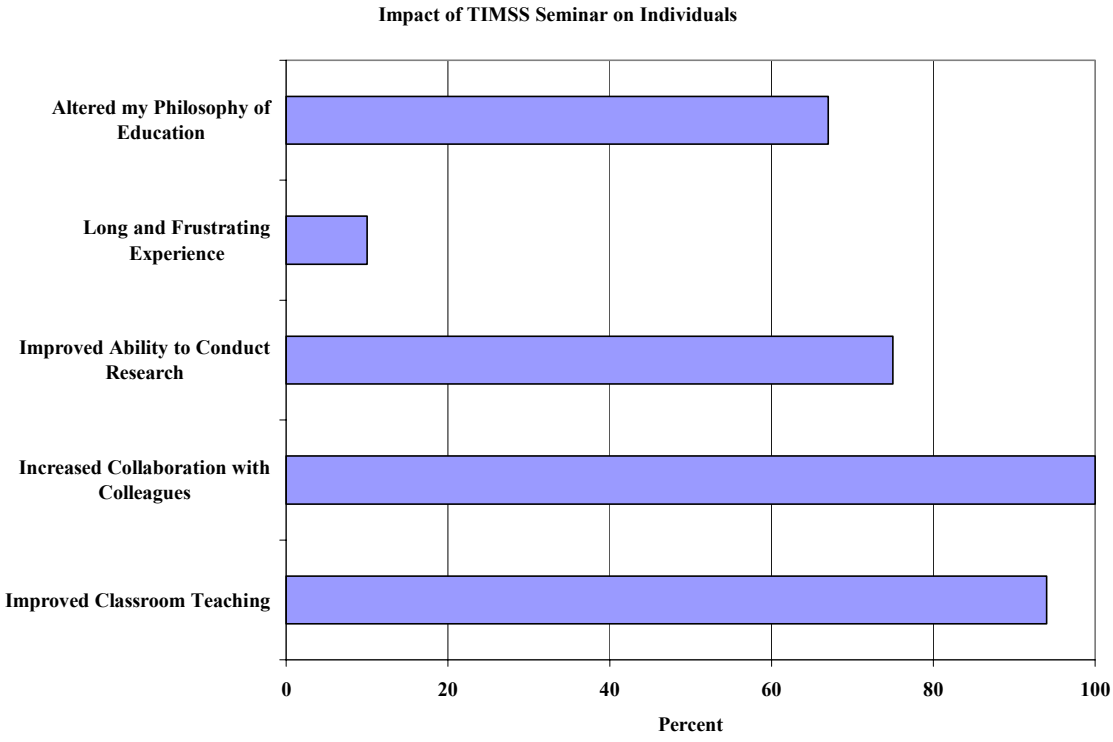
Figure 2. Percentage of participants who "agree" or "strongly agree" with statements regarding the TIMSS seminar.

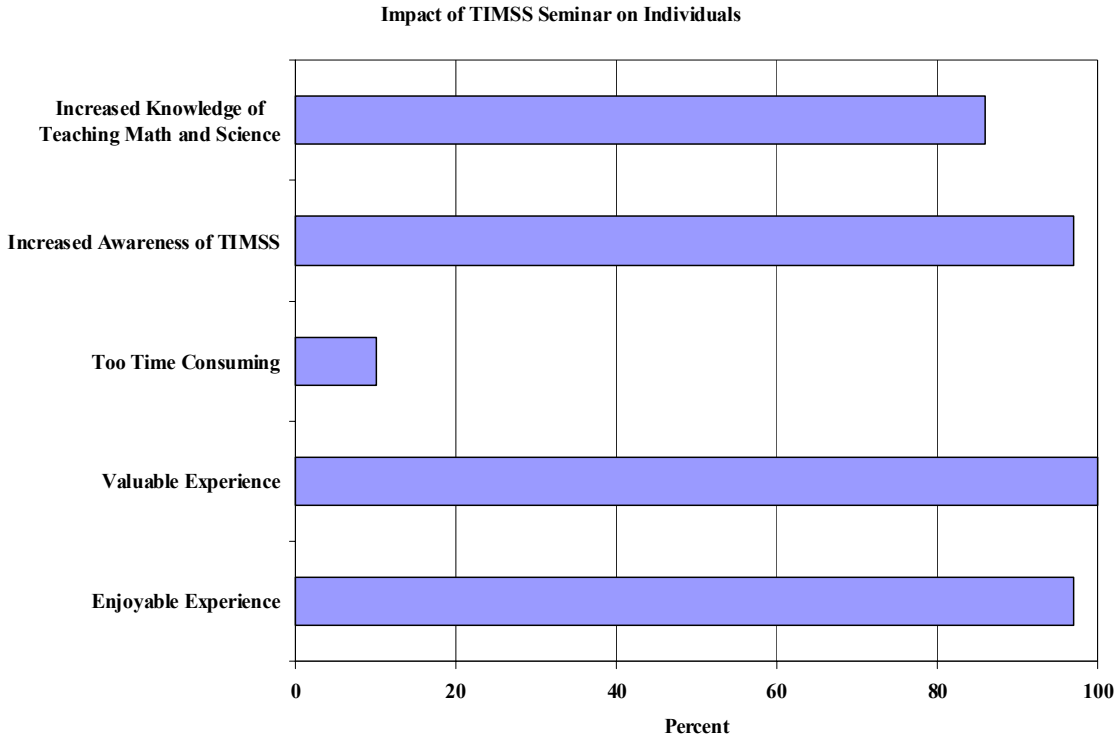
Figure 3. Percent of participants who "agree" or "strongly agree" with statements regarding the TIMSS seminar.

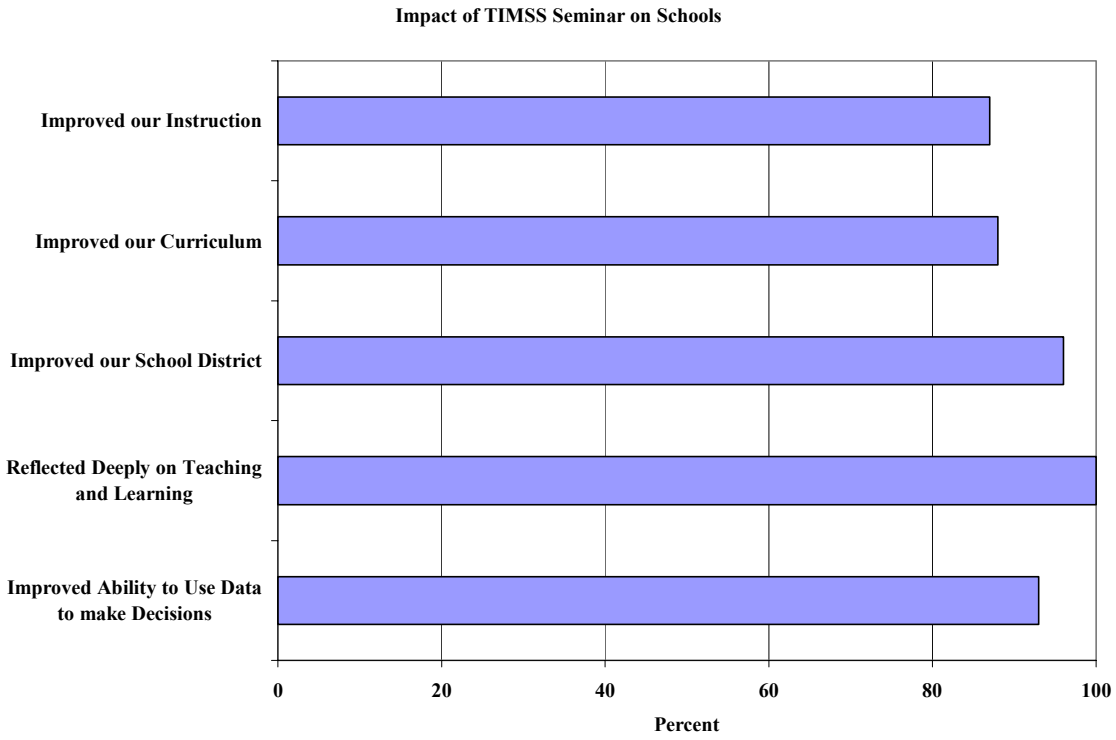
Figure 4. Percent of Participants who "agree" or "strongly agree" with statements regarding the impact of the TIMSS seminar on schools.

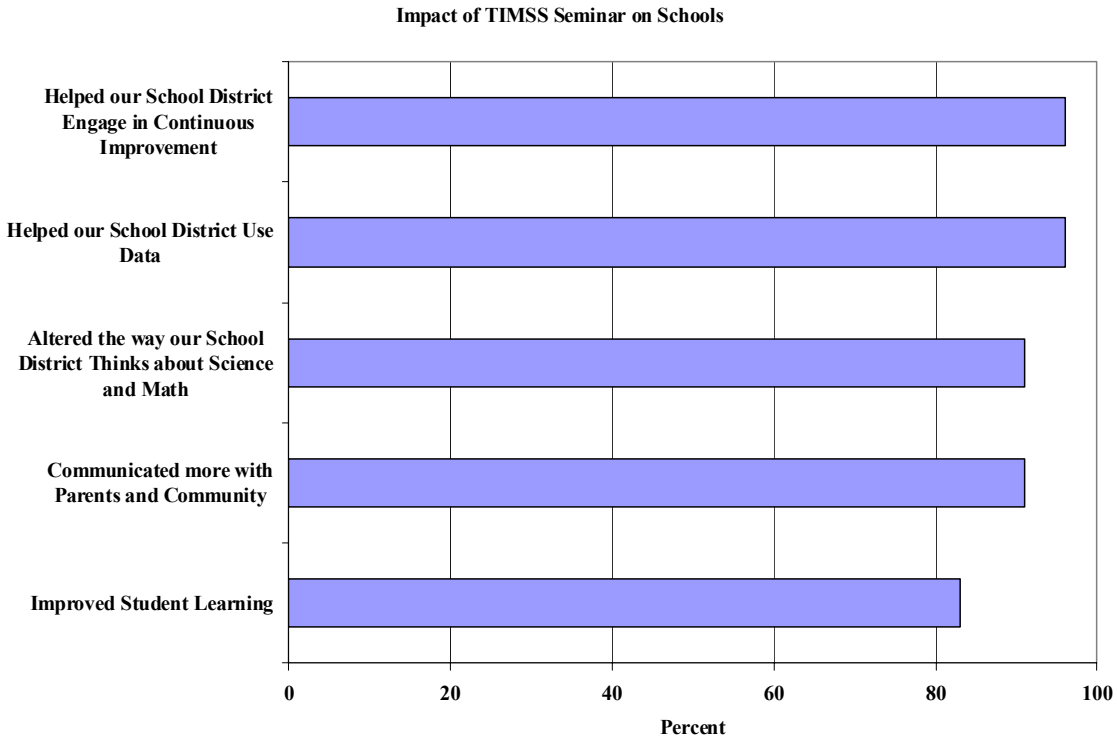
Figure 5. Percent of participants who "agree" or "strongly agree" with statements regarding the impact of the TIMSS seminar on schools.


Learn about TIMSS
Consider the Implications of TIMSS for Your Own School or District
Find a Focus for Inquiry
Collect Data
Analyze the Data
Identify a Problem
Plan for Action
Monitor Results


Impact of TIMSS Seminar on Individuals
Altered my Philosophy of Education
Long and Frustrating Experience
Improved Ability to Conduct Research
Increased Collaboration with Colleagues
Improved Classroom Teaching
0
20
40
60
80
100
Percent


Impact of TIMSS Seminar on Individuals
Increased Knowledge of Teaching Math and Science
Increased Awareness of TIMSS
Too Time Consuming
Valuable Experience
Enjoyable Experience
0
20
40
60
80
100
Percent


Impact of TIMSS Seminar on Schools
Improved our Instruction
Improved our Curriculum
Improved our School District
Reflected Deeply on Teaching and Learning
Improved Ability to Use Data to make Decisions
0
20
40
60
80
100
Percent


Impact of TIMSS Seminar on Schools
Helped our School District Engage in Continuous Improvement
Helped our School District Use Data
Altered the way our School District Thinks about Science and Math
Communicated more with Parents and Community
Improved Student Learning
0
20
40
60
80
100
Percent