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Abstract

Over the years, Ms. Lane's third grade mathematics classroom had become increasingly diverse. Challenged by the growing population of English Language Learners (ELL) and he r need to change her teaching practice to meet their needs, Ms. Lane selected to study how best to teach one of her greatest challenges, Ana, a Latino ELL who also had a learning disability. Ms. Lane and her two university mentors found that using a collaborative action research model provided a structure for researching, designing, and implementing strategies that helped Ana improve her mathematics performance. The university mentors found that they, too, benefited from working together as critical partners while assisting Ms. Lane in this collaborative action rese arch.

Keywords

Teaching Practice, Mathematics, Mentoring, Collaborative Action Research, and English Language Learners

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Meeting the Needs of a Latino English Language Learner through Teacher Research

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Over the years, Ms. Lane's third grade mathematics classroom had become increasingly diverse. Challenged by the growing population of English Language Learners (ELL) and her need to change her teaching practice to meet their needs, Ms. Lane selected to study how best to teach one of her greatest challenges, Ana, a Latino ELL who also had a learning disability. Ms. Lane and her two university mentors found that using a collaborative action research model provided a structure for researching, designing, and implementing strategies that helped Ana improve her mathematics performance. The university mentors found that they, too, benefited from working together as critical partners while assisting Ms. Lane in this collaborative action research. Key Words: Teaching Practice, Mathematics, Mentoring, Collaborative Action Research, and English Language Learners

Fundamental to the No Child Left Behind (NCLB) Act is that *every* child can learn and that all schools are accountable for student progress. One of the implications of this initiative is teacher accountability and a commitment to help every student in the classroom meet high expectations. Education Secretary Spellings (United States Department of Education, 2006) emphasized the importance of meeting the needs of the fastest-growing student population in the United States of America, the English Language Learners (ELLs). She strongly urged educators to help every child reach grade level because school children deserve nothing less.

Ms. Lane, 3rd Grade Teacher

Ms. Lane, a monolingual Anglo woman and an experienced third-grade teacher in a large urban district, taught a class with a growing highly diverse student population. Even though she had taught ELLs for four years, she had not received formal training in second-language acquisition or second-language teaching methodology in mathematics, or in how to address the specific needs of students with learning disabilities in mathematics. Ms. Lane wanted to improve her instructional practice by finding better ways to work with her ELL students who faced several barriers to success. One of her strategies for improvement was to take graduate coursework in both instructional leadership and mathematics pedagogy. This opportunity was provided by a Teacher

Quality Grant, a federally funded 17-month professional development program, which targeted elementary mathematics teachers. The competitive grant focused on both mathematics content and pedagogy using a collaborative partnership between universities and public schools. Through this grant, Ms. Lane and 11 other teachers received books, tuition, training, and manipulatives for implementing best practices in their mathematics classroom.

As part of the process of improving instructional practice, Ms. Lane and the other grant participants examined their own teaching by analyzing student data and reflecting on what areas needed improvement. This required them to also research effective teaching practices and to complete an action research project. As an expectation of the grant, two university grant project directors took on the role of mentors to participants during the classroom implementation of effective teaching practices.

Ms. Lane's University Mentors

In teaching Ms. Lane to become a classroom researcher, the university mentors performed several roles throughout the research. As both instructors and mentors, the first two authors shared strategies for effectively researching teaching practices that Ms. Lane identified as areas she needed to improve. One university professor (first author) supported her effort in improving her mathematics content knowledge and pedagogy during her action research project; the other mentor (second author) monitored and provided feedback regarding her curriculum and instructional design models. The feedback from both mentors provided Ms. Lane with the tools to evaluate and implement effective teaching practices as part of her coursework. The two mentors themselves found the information they gathered about ELLs, when helping Ana, was beneficial to their own scholarly work and professional development. For example, the first author became involved in a state-funded project for researching and designing curriculum for mathematics teachers of ELL students.

To facilitate Ms. Lane's success in the leadership internship experience, the second author's role reflected that of two colleagues working together. While guiding Ms. Lane during her leadership internship course, the second author encouraged Ms. Lane to become involved in a state supervisors' mathematics organization. The second author introduced Ms. Lane to the organization's purpose, mission, and activities as well as key leaders in the organization, so as to open doors for her future participation as a mathematics leader.

Throughout this project, the university mentors studied and followed Glickman's (2000) suggestions for helping classroom teachers succeed as instructional leaders by supporting Ms. Lane through:

- actively listening to her concerns and recommendations for improving her teaching;
- clarifying action research tasks and expectations for her future role as a leader;
- encouraging her efforts to grow in her profession and take on extra responsibilities;
- negotiating with her school administrator to support her as a teacher-researcher; and

- directing and reinforcing her ideas and actions as she completed her leadership internship.

Ms. Lane's special interest in working with ELL students was also a research interest of both university professors. This mutual interest led to both university mentors spending more time with Ms. Lane than they did with other grant participants. Ms. Lane's persistence in seeking assistance in finding solutions to helping Ana succeed, and her sense of urgency to help Ana pass the state assessment, provided a catalyst for the university mentors to collaborate on this action research project and reflect on what worked and didn't work with Ana.

Ms. Lane and her Latino Student

Ana was one female student in Ms. Lane's class of 25 who had not passed the required state mathematics and reading assessments during the year she was in her class. Ana was identified as an ELL who was also classified as a "low socio-economic" student. By the end of the school year, Ana had failed the reading section of the state assessment twice. Without passing this portion of the test, she could not be promoted to the next grade unless extensive tutoring occurred. During the year, Ana was diagnosed as having learning disabilities in reading and language, but not in mathematics.

Ms. Lane faced several issues involving teaching and assessing diverse learners in her classroom. She was aware of the challenges brought by the NCLB Act and realized that more studies were needed to help teachers meet the needs of all students, including those with special needs and different cultural backgrounds. The following questions raised by Bresser (2003) guided Ms. Lane's own inquiry into her practice.

- How can we help all students, especially English-language learners, develop computational fluency if they have experienced mathematics as a quiet, solitary practice of standard procedures?
- How do we make communication the focus of mathematics class so that mathematical conversations are productive and accessible to everyone?
- What sensitivity, awareness, and skills do teachers need when working with students from diverse backgrounds, with differing experiences and skills, who may be learning English as a second language? (p. 294)

Ms. Lane kept these questions in mind as she developed strategies to help Ana gain proficiency in number operations and word problems, one of her lowest performing areas. If Ana were to catch up with her peers in mathematics, she would need intensive one-on-one tutoring with effective strategies, but which strategies would work best for Ana, given her learning difficulties?

Using Collaborative Action Research to Improve Teaching

Finding solutions for teaching Ana, when previous strategies had not worked, challenged Ms. Lane to examine her own teaching practices. Through a systematic approach, using collaborative action research, Ms. Lane attempted to conduct her own inquiry into what she could do to meet Ana's needs (and students with similar needs).

Action Research

Researchers have found that one of the outcomes of action research is that it meets a need for teachers to increase the predictability of what happens in their classrooms (Glickman, 2000; Mills, 2003; Sagor, 2000; Stein, Smith, Henningsen, & Silver, 2000). In action research, teachers examine specific aspects of their work, allowing them to engage in self-reflective inquiry (McNiff, 2002). Through this type of research, teachers get to see that a given curriculum, instructional strategy, or use of technology will positively affect (or not affect, or negatively affect) student outcomes (Mills, 2003).

Collaborative Action Research

Teachers sometimes see a disconnect between research and practice. Kennedy (1997) hypothesized that this is due to teachers' poor access to research findings. Simply informing teachers about research is unlikely to bring about change (Mills, 2003). In addition, teachers often report that, without guidance, it is difficult to analyze and reflect on their own instruction (Stein et al., 2000). Ms. Lane found that she could be more effective in her action research if she collaborated with others; in this case the two university mentors. Collaborative action research can take many different forms, as supported by Glickman's work (2000) with classroom action research teams. In his work, he found that while there are several structures that work to provide classroom assistance to teachers who want to improve instruction (clinical supervision, peer coaching, critical friends), collaborative action research can be tailored more specifically to the needs of individual students, such as the case with Ms. Lane's work with Ana.

Ms. Lane's Journey through Collaborative Action Research

As one of 12 elementary mathematics teachers who participated in a 17-month mathematics staff development program (Jasper & Taube, 2004), Ms. Lane was involved in classroom-based investigations during the implementation phase of the project, funded through the Teacher Quality Grant. Six of the participants in this program were also preparing to be instructional leaders with mathematics as an area of specialization. Ms. Lane was one of these six individuals. She decided to develop an action research revolving around Ana, an ELL, as a requirement for her graduate research course, which she took during the summer and fall semesters.

Steps of the Action Research Model

With her mentors' guidance, Ms. Lane analyzed several action research models to find what would work best for her situation before beginning her project. Four of these well-published models (Calhoun, 1994; Kemmis & McTaggart, 1988; Sagor, 2000; Wells, 1994) shared common elements for action research including, a sense of purpose based on a problem or area of focus; collecting, analyzing and interpreting data; and some form of action that the teacher-researcher implements to solve a problem (Mills, 2003). The seven-step model developed by Kemmis and McTaggart was both comprehensive and applicable to the setting of a classroom teacher. This particular model was very similar to the problem solving models utilized by Ms. Lane in the mathematics classroom, which made it easier for her to apply in her own setting. Using a research-based model also added validity to the collaborative action research conducted by Ms. Lane.

The following section describes the model that guided Ms. Lane's classroom inquiry. The seven steps that Ms. Lane followed included:

1. Define the problem or instructional issue.
2. Gather background information on the student(s).
3. Review the literature in the area of concern or need.
4. Develop and implement an action plan for resolving the problem or meeting the need.
5. Collect and analyze data to determine effectiveness of the intervention(s).
6. Reflect on process and outcomes of action plan.
7. Revise instruction based on data, teacher reflection, and feedback from mentors.

Step 1: Identify the problem

As Ms. Lane began her inquiry, she focused on identifying problems involving strategies to help Latino ELLs become successful in meeting the standards set by the state for 3rd grade mathematics. Ms. Lane identified not one, but two problems. One, she needed to modify her own instruction to meet the needs of all of her ELL students. The second problem involved finding ways to motivate Ana, specifically, because she was retained the previous year and had been diagnosed with a learning disability. Ana was the only ELL student Ms. Lane had who had both a learning disability and who had been retained, which made helping Ana to succeed even more challenging and a meaningful subject for her research. Ms. Lane found that Ana had many gaps in her learning of math concepts (more so than other students in her class). Even so, Ana was willing to try whatever Ms. Lane offered her and was able to stay after school, making her a prime candidate for selection in Ms. Lane's research project. In addition to finding solutions to Ana's learning gaps, Ms. Lane hoped to apply what she learned to her work with other ELLs in her class.

Step 2: Gather background information on the student(s)

Ms. Lane proceeded to collect available information about Ana's academic performance, and her family and home experiences, to better understand Ana's needs as a learner. Ana was in a special education program and diagnosed as having learning disabilities (LD) in reading and language arts, but not in mathematics. Ms. Lane knew that Ana needed additional help in reading in order to pass future mathematics assessments because of Ana's learning disabilities. Under state law, a child in third grade has to pass the reading portion of the state assessment in order to be promoted to the next grade. Since the mathematics assessment was mostly word problems that required substantial reading, Ms. Lane decided that Ana needed to hone her reading comprehension skills in order to pass the mathematics portion of the test.

Ms. Lane knew that she would need the support of Ana's parents, during a three-month intervention, to help Ana catch up with her peers. Ana's parents spoke fluent Spanish and understood some spoken English, and both finished eighth-grade in Mexico. Ana's parents wanted the best education for their children, and they were both interested in helping them with homework and supporting their attendance in after-school tutoring sessions when needed. Ms. Lane contacted Ana's parents to learn more about her background and her needs. This led Ana's parents to clearly see that Ana needed help and could be successful with Ms. Lane's intervention. By establishing a trusting relationship, through informal conversations and Ms. Lane's display of genuine interest in Ana, the parents began meeting with Ms. Lane frequently on strategies for how they could help Ana at home. In addition, Ana's parents made extra efforts to support Ana by having her attend additional tutoring sessions during the summer with Ms. Lane.

Other information, such as the minutes from her Annual Review and Dismissal (ARD) meetings, the diagnostic assessments regarding her learning disability, and her previous state-assessment results in reading as well as mathematics, were gleaned from Ana's files. From her file, it was found that Ana regularly attended school and had no behavior problems. Ms. Lane also interviewed other school personnel such as the district diagnostician, the school counselor, and Ana's second grade teacher. During this step, vital information was pulled together to make decisions regarding Ana's needs.

Step 3: Review the literature in the area of concern or need

As part of her research course, Ms. Lane conducted a review of the literature on helping English Language Learners learn mathematics. In her literature review for strategies, she came across Bresser (2003) who posed insightful questions about understanding how students learn in mathematics classrooms. In addition, Ms. Lane learned that the teacher of ELLs needed to (a) "talk through" the strategies with the student, or provide a peer who could do the same while the teacher observes the interaction, (b) encourage ELLs to participate by arranging discussions to allow the students to work in small groups, (c) use prompts with questions, and (d) encourage communication to promote both computational fluency and English-language development (Bresser, 2003).

Ms. Lane discovered that students' abilities to solve problems were affected by their learning disabilities in reading. She also found that while the difficulties associated with mathematics problem-solving have been studied extensively with all types of students, not all researchers agreed on the effectiveness of interventions for students with learning disabilities. Some researchers argued that previous practices for working with students with learning disabilities in mathematics were not very promising (NCTM, l989; Owen & Fuchs, 2002). However, other studies (e.g., Behrend, 2003; Buschman, 2004; Giordano, 1990) indicated that students with learning disabilities could be successful in mathematics if they could make sense of the problem (e.g., use "personalized" problems) and focus intently on the conditions given in the problem. Researchers on intervention programs for students with learning disabilities (Kroesbergen & Van Luit, 2003; Wilson & Sindelar, 1991) further recommended teaching basic mathematical skills using a direct instruction approach. Other effective teaching methods included using visualization through graphics, pictures, and manipulatives (Sharma, 1983) as well as step-by-step procedures to solve problems.

Ms. Lane also wanted to know how a student's English language proficiency affected his or her ability to learn mathematics in English speaking classrooms. She found research (Bresser, 2003; Sharma, 1985a, 1985b) indicating that students need to acquire mathematical language as well as the conversational or social language fluency when learning a second language. She learned that non-English speakers face challenges in deciphering the language of mathematics. Textbooks were of little help in this case, since many emphasized "specialized" or formal terminology, which often required rigorous reading and language application (Sharma, 1985a, 1985b). Sharma (1985a) even argued that mathematics is a second language, since it has its own alphabet, symbols, vocabulary, syntax, grammar, and literature.

Step 4: Develop and implement an action plan for resolving the problem or meeting the need

After synthesizing the literature, Ms. Lane developed a plan of action, which included scheduling one-on-one tutoring after school, using direct instruction techniques as recommended by researchers Wilson and Sindelar (1991) as well as sheltered instruction strategies (Echevarria, Vogt, & Short, 2004). Direct instruction builds on small incremental steps to learning that incorporate modeling and practice. Sheltered instruction involves teaching content areas (e.g., mathematics) through a developmental language approach. For example, scaffolding, a sheltered instruction strategy, supports the learning of a new concept by modifying syntactic structures, using a controlled vocabulary and shortened sentences (Soltero, 2004). These strategies were incorporated in Ms. Lane's instructional plan for Ana and are further described below.

Ms. Lane and Ana began working on third and fourth-grade vocabulary lists drawn from the school district's curriculum. These lists consisted of 25-30 words for each six-week period. Ms. Lane taught Ana vocabulary by sight recognition and phonics. They would look at the letters and sound them out. The teacher would repeat the words and define them. Ms. Lane taught Ana how to recognize words that appeared frequently in the mathematics word problems.

The next task was learning the number facts using multiple approaches. For instance, an interactive software program was used that allowed Ana to practice her number facts and receive feedback as to how many she would get correct. Ms. Lane also devised triangular-shaped cards on which a number was written on each of the corner. For example, one card had 3, 6, and 18. The student would say each number fact in four different ways: 3 x 6 = 18, 6 x 3 = 18, 18 ÷ 6 = 3, and 18 ÷ 3 = 6. The purpose of this exercise was to help Ana relate the three numbers in a meaningful way. Additional cards were prepared for Ana to practice at home or during tutoring. Ms. Lane further used the cards to practice subtraction facts, since Ana seemed to have more difficulty with subtraction. She observed that subtraction was difficult for Ana to retain and that she, the teacher, needed to work on helping Ana make connections to her world. For example, Ms. Lane taught Ana how to sing the number facts and encouraged her to do likewise at home with her siblings.

Step 5: Collect and analyze data to determine effectiveness of the intervention(s)

Ana's mathematics score on the state assessment, during the initial administration, was used as baseline data for measuring her progress after the intervention occurred. After three months of intensive tutoring, Ana was re-tested. Her score on the state mathematics assessment revealed a marked improvement in both her understanding and application of concepts in mathematics. Reading the test items without assistance, Ana increased her score from 47% in the April administration to 65% in October. Although 65% was still not a passing score, Ana made a significant leap. When Ms. Lane read the test questions to her (as per modifications for her disabilities), Ana was successful in answering all the items correctly. Ana satisfactorily explained how she got her answers, used strategies that were taught, and, more importantly, demonstrated confidence in her own abilities.

After the intervention Ana showed growth in several areas, two of which significantly impacted her mathematics performance. These included mathematics vocabulary and solutions to word problems. The following are Ms. Lane's analysis and interpretations of Ana's progress in these two areas.

Mathematics vocabulary. Ana's vocabulary had expanded as evidenced by her ability to "think aloud" while she worked on computation and reading word problems. For example, when asked to find the *product*, she could multiply the two numbers given. She knew that *factors* are the numbers we multiply to get the *product.* She gradually recognized phrases that provided clues on what operation was appropriate, and could name place values either orally or in writing. Over time, Ana became comfortable using the appropriate mathematical language in explaining her process for solving a problem.

Word problems. Ana's ability to solve word problems had also increased remarkably. She felt proud that she could successfully solve word problems by applying the strategies she learned. She quickly knew when she made a mistake and she was able to correct the error. Ana also became better in using elimination when choosing the best answer in a multiple-choice test item. As they worked together over time, Ms. Lane was impressed with Ana's ability to read and solve word problems.

Step 6: Reflect on process and outcomes of action plan

At the end of each one-on-one tutorial session, Ms. Lane recorded her interactions with Ana, her progress, and some observable impact of the intervention strategies she had implemented. For example, looking back, she wrote the following,

> There was no perfect model for tutoring. I tried to adapt the methods I read in the research. Some of the methods were ones that I already have been using in my classroom. But this time, I was able to focus more on the results on one specific learner and to use assessment data to make instructional decisions.

On teaching vocabulary words, Ms. Lane described her strategies in the following way,

> I would have Ana circle important words in the word problems and then discussed the meanings of these words. We tried to identify what words were repeated frequently. I hoped that Ana would recognize these words on sight. The majority of the time was spent on reading and solving different kinds of word problems.

Ms. Lane also found that strategies such as sheltered instruction, along with a direct one-on-one instruction appeared to be successful in increasing Ana's participation and engagement in learning mathematics concepts.

Ms. Lane took pride and ownership in her action research. Her field notes and journals revealed her thoughts about her teaching practices and how her student, Ana, responded to her instruction. For instance, she described Ana's transformation into a confident learner, much like a "butterfly that just got squeezed out of its cocoon." These encouraging results took hard work as revealed in Ms. Lane's last entry in her journal.

> Ana is no longer afraid to make mistakes because she can understand how to correct them on her own. Overall, I see a confident student who rose to the task after feeling crushed due to poor performance on the standardized test. I know she still needs more practice in her number facts. This may have to be a daily occurrence for her to maintain her level of competence. Tutoring may need to be continued to support her skills.

Step 7: Revise instruction based on data, personal reflections on teaching and mentors' feedback

Ms. Lane revised her instruction as she determined what was working, and what wasn't, with Ana through informal assessment. By closely studying what worked and what didn't work, Ms. Lane was able to adapt her instructional models and time spent on specific activities to better meet Ana's needs. Some of her revisions include the following,

- In the beginning of her tutoring sessions, Ms. Lane knew very little about Ana's individual strengths. As she worked with her, Ms. Lane was better able to both recognize and build on Ana's strengths to help her solve new problems. For example, Ana's ability to use elimination as a problem solving strategy transferred easily to new problems during tutoring and on in-class mathematics assessments.
- Ms. Lane reinforced Ana's success with problem solving strategies each time she effectively applied these to a new situation.
- Ms. Lane knew very little about incorporating sheltered instruction strategies into mathematics instruction before working with Ana. Her own ability to help Ana see the connection of mathematics as a "second language" improved over time. The multiple representations of number facts, described in Step Four of the previous section, developed from Ms. Lane's reflecting on what did and did not work each time she reviewed this concept with Ana. For example, when previous strategies failed to demonstrate retention of number facts, Ms. Lane researched this area and found that connecting number facts with concrete representations from Ana's world "personalized" mathematics for Ana and increased both her understanding and retention of the number facts.
- Working with students one-on-one on a daily basis was a powerful tool in improving student performance, which required continuously modifying teaching strategies.
- After working with Ana, Ms. Lane found that working with families was vital to implementing interventions with struggling students. She learned that it helped build a trusting and supportive relationship needed to help Ana gain confidence in her own ability to solve problems.
- Collaborating with others (in this case, two university mentors) became an important step to finding solutions to classroom problems by clarifying questions, challenging preliminary findings, supporting efforts, and reinforcing a teacher's self-confidence. Ms. Lane shared her frustration over teaching problem solving strategies to Ana with her university mentors. Through discussion, the university mentors shared research with Ms. Lane that demonstrated the importance of student writing in mathematics. Ms. Lane began incorporating more opportunities for Ana to record her solutions in words as well as symbols. She then had Ana read orally what she had written in order to reinforce the oral and written language connection. This strategy was then consistently built in to each session with Ana.

Reflecting on the Collaborative Action Research Process: Ms. Lane's Experiences

Ms. Lane and her university mentors found reflection to be invaluable in the action research process. To facilitate this reflection step, the mentors developed several questions which they used to focus discussions on how Ms. Lane's teaching practices were changing. For example, a short questionnaire was sent via email to Ms. Lane after she completed her action research. Although both formal and informal data was collected throughout the action research process, this instrument allowed Ms. Lane to reflect on

and articulate her experience as a whole. Her responses to each question are summarized below.

Question 1: In what ways was the classroom research helpful to you as a math teacher?

> The classroom research was immensely helpful for me. It gave me an insight into different teaching methods and why they worked with different children. It opened my eyes to new ways to reach children. I was able to try the things I was reading in journals and magazines in the classroom. It adds variety to the classroom and new ways for students to learn.

Question 2: How did it change your knowledge of: (a) math content, (b) teaching mathematics, and (c) learning how to teach math (pedagogical knowledge)?

> The classroom research helped me to learn more about the math content. I had been attending staff developments and workshops to keep up with the math, but the research added another dimension to my awareness. It also helped me to understand that there are more ways to teach mathematics, some of which I had used for many years. In addition to these" tried and true" methods, I learned some new ways to achieve the same goals. I was amazed that it made a difference in how some of the children learned.

Question 3: How did the action research you have conducted change your beliefs about: (a) diverse learners, (b) learning math by students, (c) teaching math, (d) assessment, and (e) family support?

> The action research gave me insights on teaching diverse learners. It helped me to understand the different ways different children learn. I was amazed that learning math by students comes in different waves. Some catch on quickly and others require more repetition. In reading the research, I realized that there is not one particular way to teach math. Assessment was really important to me. I know that there are many ways to assess what the children have learned. I know this helps the children to see it doesn't always have to be paper and pencil. It gives me different methods of obtaining information for each child. Finally, the family support of the students I have is really different for each family. I am learning what works for one family doesn't necessarily work for another. Through the research, I have learned different methods in reaching the families of my students.

Question 4: What new belief system/s have you formulated as a result of the classroom research you have conducted?

> In doing the action research, I learned that I can never know it all. My mentors were helpful in many ways. Working with Ana, showed me that different approaches work with different students and that working with a

> student's strengths instead of their weaknesses is the key to reaching at-risk students. Continuously assessing Ana's progress helped me to better analyze her needs and individualize instruction for her. I spent many years just doing the same things from year to year.

Ms. Lane's responses above seemed to indicate a positive change in teaching practice, supported by her research in her own classroom, with her own student. Ms. Lane's classroom research supports the literature (An, 2004a, 2004b), asserting that teachers need to know content knowledge, methods for teaching the content, and how students learn in order to make a difference.

Reflecting on the Collaborative Action Research Process: University Mentors' Experiences

On another level, discussions between the two university mentors were held regarding strategies that did and did not facilitate Ms. Lane's research. This information was gathered through field notes, emails, phone calls, and reflections as part of the teaching process. From this information, the university mentors were able to modify their own approaches with other students, based on what was or was not working with Ms. Lane. For example, the first author gathered information for her Teacher Quality Grant, while the second author was a professor of educational leadership, supervising Ms. Lane's internship. During the internship, Ms. Lane "job-shadowed" her school administrator and completed several school improvement projects related to improving mathematics teaching and learning. One of these projects included a professional development component, which involved participating in the state mathematics supervisors' organization. During this project, the second author assisted Ms. Lane in learning about the organization, attending meetings together, and networking with other mathematics leaders across the state, which raised their relationship to another professional level.

Trustworthiness of the Study

To lend value to Ms. Lane's study, the university mentors monitored Ms. Lane's study for trustworthiness as defined by Guba (1981). Guba's recommendations for qualitative action research included building trustworthiness into a study by addressing the following characteristics: credibility, transferability, dependability, and confirmability. Below we define and illustrate with examples from our study how each of these was addressed.

Credibility

Credibility refers to how well the researcher describes action or events in a study so that everyone who participated in the event will say, "yes, that is how I see the situation" (Geelan, 2004). Multiple data sources were used to determine Ana's needs and how effective the strategies were working.

In this study, Ms. Lane conducted three months of intensive tutoring with Ana in which she interacted daily in both classroom and individual settings. Ms. Lane's journaling and reflections along with her university mentors' field notes and feedback, served to validate the credibility of her work with Ana. In addition, Ms. Lane's research on best practices for working with ELL students spanned a 6-month period. Credibility was further maintained when the university mentors and Ms. Lane held debriefing sessions to reflect on how well the process was going to provide feedback on needed revisions in the process.

Transferability

Transferability allows for other researchers to apply the strategies utilized in a study to their own situation (Geelan, 2004). To improve the transferability of Ms. Lane's work with Ana to her own work with her other (and future) students, Ms. Lane recorded as much data as she could about Ana and her progress during the time of the study, by keeping a database of what strategies worked and what materials and resources she found useful. Ms. Lane's careful and detailed recount of her work with Ana, particularly her intervention strategies, contributes to the transferability of this study. This detail was described within the context in which it occurred. In this manner, the results of the study can only be applied to other teachers who have students similar to those in Ana's situation and setting.

Dependability

Dependability involves maintaining stability and consistency in recording and reporting data (Lincoln & Guba, 1985). The dependability of Ms. Lane's action research with Ana was strengthened through multiple researcher verification, and by journaling, keeping field notes, and debriefing. The university mentors examined and monitored the processes of data collection, analysis, and interpretation to establish an "audit trail" to validate the results of the study (Mills, 2003). For example, Ms. Lane's reflections on her changing teaching practices (i.e., making connections to real world experiences) were validated by recorded observations of her teaching and reviews of lesson plans as well as student work (artifacts).

Confirmability

The construct of confirmability involves ensuring that the findings of the research are grounded in the data rather than in the whims of the research team (Kelly & Lesh, 2000). If the findings are confirmable, then, an external observer should be able to reconstruct them by way of the data (Kelly & Lesh). Ms. Lane was careful to document both her findings and her process for completing each step of her action research project. In addition, the university mentors kept notes on their involvement in the process and the efforts made to maintain objectivity as a researcher. For example, in the initial steps of this study, Ms. Lane observed Ana in the classroom and made some initial judgments regarding what Ana needed to be successful. She then compared her initial analysis with the state standardized assessment data to check for agreement. Ms. Lane's dilemma in

working with Ana was, "Does Ana have difficulty understanding how to solve problems or is her learning disability in reading hampering her ability to answer questions on the state assessment?" Until she began to assess Ana individually in this study, she could not determine what strategies to use with Ana. In addition, when Ms. Lane assessed Ana's understanding of number concepts informally, she also compared that data with the local district benchmark assessments to verify whether Ana was progressing as "observed."

Summary

In this article, we described the journey of third grade teacher, Ms. Lane, as she conducted collaborative action research to improve the mathematics performance of Ana, a Latino English Language Learner. Through planning, implementing, observing, and reflecting Ms. Lane was able to help Ana overcome several barriers to mathematics achievement that Ana faced. By implementing a three-month student intervention, Ms. Lane helped Ana to reach a conceptual understanding of grade level mathematics topics, build her mathematical language base, and strengthen her confidence in her ability to meet 3rd grade mathematics state standards. Ms. Lane's journey was enhanced through the support of two university mentors, who guided her through a collaborative action research process. The university mentors supported her by visiting her classroom, modeling strategies, finding resources, involving her in intellectual discourse, teaching her how to research topics, and effectively assess student performance. Ms. Lane's university mentors also served as sounding boards for her ideas as she reflected before and after trying alternative strategies.

The first two authors found that while teaching Ms. Lane the skills needed to conduct effective action research, the university mentors were also analyzing and reflecting on the effectiveness of teaching collaborative action research. These authors found that they improved their own teaching while helping Ms. Lane improve hers. In addition, the experiences the university mentors had during this process strengthened their advocacy for working with English Language Learners. This manifested, for example, in multiple presentations at the state and national level and a state grant for designing mathematics instruction for ELLs.

Ms. Lane, too, began developing her own theories of what works and does not work in teaching and learning, particularly with English Language Learners. For example, she solidified her beliefs in using multiple representations (e.g., pictures, manipulatives, computer software) in teaching mathematics. More importantly, her knowledge and skills in teaching mathematics using different approaches improved. By following a collaborative action research design, both Ms. Lane and her university mentors (all three authors of this paper) found a way to resolve important issues regarding which teaching practices in mathematics were most effective in improving the performance of one English language learner. This process heightened the awareness level of both Ms. Lane and her university mentors in the benefits of conducting collaborative action research as a way of improving teaching practice. Ms. Lane concluded that this "spiral process engaged me as a thoughtful problem solver throughout the inquiry, challenging me to reach beyond my original goal to help Ana, to that of improving my skills as a researcher."

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