

DEVELOPING A CRITICALLY REFLECTIVE PRACTICE THROUGH CASE-BASED PEDAGOGY

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A narrative inquiry approach (Connelly and Clandinin, 1990, 2000) to research was at the heart of this study. This study features use of narrative inquiry to explore the learning experiences of sixteen prospective secondary school science and mathematics teachers as they were involved in the dilemma brainstorming, writing, sharing, and discussion of cases – cases that express dilemmas and reflect the inherent uncertainty and complexity of the world of teaching and learning. Narrative inquiry, as a way of understanding learning experiences, enabled the researcher and the participants to live, tell, re-examine, reflect on, and retell stories – stories which made the researcher and the participants to understand their teaching practices. Narrative also provided context for the researcher and the participants in this study to pursue alternate ways of thinking using multiple data sources. Various forms of narrative inquiry including cases written by prospective teachers, solutions they provided to open cases, their written reactions to closed cases, and transcripts of case discussions and participants' reflections have been used to transform discourse among all participants in this study and their teaching practices and experiences into a communicable praxis. This praxis has come to be referred to as "case experience" (Arellano, Barcenal, Bilbao, Castellano, Nichols, & Tippins, 2000b). This paper concludes with the discussion of the potential and relevance of case experience, in a narrative inquiry, as a vehicle to inform science and mathematics teacher education pedagogy, reform, and research in the future.

Mentoring secondary school science and mathematics student teachers is a complex process that calls for creativity and reflective practice on the part of cooperating teachers. This is even more intensified by the concern of teacher educators to provide support for prospective teachers as these beginning teachers prepare to leave university and enter the school

classroom fulltime. This calls for teacher education curricula to be aligned to reflect the interests and changes of globalisation. Accordingly, there is a need to help prospective teachers acquire and develop skills that facilitate learning from their own experience within the context of the classroom (Richert, 1992). Only when novice teachers understand their own chosen practice can they develop feelings of competence and adequacy as beginning teachers.

In the past decades, educators have identified cases as one of the tools that are more specific towards exploring issues and facilitating decision-making than others. And as such, teacher educators as well as educational researchers have become increasingly interested in case-based pedagogy for helping prospective teachers construct teaching knowledge and reflect on their own teaching (Nichols, Tippins, & Wieseman, 1997). As prospective teachers develop new images of instructional practice, classroom cases provide a tool through which teaching practices can be viewed with meaning and context. Cases also provide novice teachers specific scenarios and dilemmas they will likely encounter in teaching. In this sense, cases enable prospective teachers to actively construct knowledge as they use their own experiences. Classroom cases in teacher education have emerged in various formats to illustrate problems or dilemmas in teaching and learning.

The author has attempted to find an alternative methodology of mentoring prospective secondary science and mathematics teachers, and thought of exploring a case-based pedagogy by exploring ways to create opportunities for dialogue and conversation. Hence, a case-based experience was designed as a context for looking into dilemmas and tensions of science and mathematics teaching and learning. The case-experience provided the author with an opportunity to learn as an associate with practicing secondary science and mathematics teachers as they try to wrestle with the issues that confront their teaching and learning in their classrooms. This study was guided by two research questions:

- What sort of critical reflective science or mathematics learning is generated through case experience, and of what significance is this learning?
- How does the case experience provide a context for creating a reflective science and mathematics teaching and learning community?

BACKGROUND OF THE STUDY

Context of the Study

This study took place at the Secondary Laboratory School of West Visayas State University at Iloilo City on the island of Panay. Panay is one of 7,100 islands that comprise the Republic of the Philippines.

The university is one of the 110 state-funded institutions of the country with a mandate to offer tertiary education. One of its eight colleges is the College of Education that was chosen as Centre of Excellence in Teacher Education.

One of the courses, that students in the College of Education have to undergo during the final year of their schooling, is Student Teaching. This course is designed to train prospective teachers in the application of the principles and strategies of teaching and evaluation in actual teaching situations. It also provides training to prospective teachers in the utilization and preparation of appropriate teaching aids and instructional materials in their specific fields. To accomplish its objectives, the course involves observations and participation in professional in-campus and off-campus classroom instruction and other related activities.

Students enrolled in Student Teaching are under the supervision of the cooperating teachers. Four coordinators oversee Student Teaching programme in the secondary school with each coordinator supervising student teachers in a particular field of specialization. The researcher was involved in student teaching as one of the student teaching coordinators and as one of the cooperating teachers and she worked closely with the student teaching field experience program particularly for student teachers with mathematics as specialization.

METHODS OF THE STUDY

A narrative inquiry approach (Connelly & Clandinin, 1990, 2000) to research was used in this study. Narrative inquiry, as a way of understanding learning experiences, enabled the researcher and the participants to live, tell, re-examine, reflect on, and retell stories – stories of classroom experiences which made the researcher and the participants understand their teaching experiences. Thus this study pertains to our classroom “stories lived and told” (Connelly & Clandinin, 2000, p. 20).

The case session actually involved activities that went beyond the case writing and case sharing session. The researcher eventually referred to this set of activities as the case experience (Arellano, Barcenal, Bilbao, Castellano, Nichols, & Tippins, 2000b) which included orientation and dilemma brainstorming, case writing session, development of written cases by the participants, small group discussion and sharing of the written cases, writing of solutions to open cases and reactions to closed cases, and focus group discussion of the cases as well as solutions provided to open cases. It was through the case experience that multiple data sources were generated. The method of generating data is described in the following section.

PROCEDURES

The researcher designed the case method described in the following pages to explore the notion of case-based pedagogy. While so doing, the researcher was trying to address a number of teacher education concerns. The objectives were to have the prospective science and mathematics teachers write and reflect on some aspects of their work that they consider problematic and then share their reflections with their fellow student teachers. This exercise involved developing the skills of problem identification and conceptualization, as well as written and verbal communication. Helping teachers expound on what they know by writing about it, talking about it, and sharing it with colleagues improves not only the individual teacher concerned, but also the teaching profession as it is changed and shaped by people who understand it.

Sixteen science and mathematics student teachers at West Visayas State University Secondary Laboratory School, Iloilo City, Philippines during the second semester of the school year 1999-2000 responded to an invitation to participate in the case experience. They were called to an informal conference after eight weeks of practice teaching. During this conference, I introduced the idea of case methodology by discussing what cases are, how we might learn from classroom cases in education and teaching, and how student teachers are an important source of case material if we are to adopt case methodology in mentoring prospective teachers. Explaining the ideas and terminology was very useful for student teachers considering that they have no previous experience with classroom cases.

Part of the session was focused on how to get started writing a case. We thought and discussed about the content of the cases – the issues and dilemmas we faced in our work as teachers. During the brainstorming session, the student teachers raised problems and dilemmas from their teaching experience. Some of the issues raised concerned about discipline and motivation of students, large class size, preparing teaching aides and devices, lack of respect from students, lack of reward and praise, and inadequate resources. These were the problems that caused burnout among student teachers (Bilbao & Castellano, 1999). These problems were also identified as those that contributed to burnout and attrition to teachers who have been in the classroom for five or more years (Arellano & Bilbao, 2000).

This brainstorming of ideas seemed to “break the ice” among student teachers. Each one seemed to have a lot to contribute and the process provided them a lot of opportunities to commiserate with one another about the circumstances of their work. The session also provided ideas about the topics they might write about and a sense of confidence in getting started with the writing of the cases.

To make the writing of the cases even easier, the researcher provided examples of brief cases (or vignettes) from *Cases in Middle and Secondary Science Education: The Promise and Dilemmas* (Koballa and Tippins, 2000). The researcher gave out examples of cases that were discussed together, first in terms of the content of the case (e.g., What questions and issues are raised by the case? How do you feel about them?), then in terms of its form (e.g., How do you understand the case?, Has the writer made his/her point clear?). We also looked into the questions for reflection and discussion provided at the end of each case. The use of examples from the casebook was extremely helpful. The student teachers found the vignettes intriguing; they generated considerable discussion especially on questions for reflections and discussion.

At the end of the sessions, the student teachers were asked to write an open or closed case from their experience using real situation with details of their observations and interviews. The case included a clear description of the problem. Likewise, it included the following components (Nichols, Tippins, & Wieseman, 1997).

- Description of the teacher
- Teacher's background experience
- Description of school
- Teacher's feelings and intentions
- Students' feelings and intentions
- Dialogue
- Description of other relevant parties (e.g., parents, principals, other teachers)

In writing the open case, the student teachers were asked not to include solutions, outcomes or morals. They may use as many or as few of the mentioned components.

The second session was spent on discussing and sharing of the written cases. Working in groups of four, the student teachers read and responded to one another's cases one by one. They read the case and wrote a reaction to its content. The discussion of each group was tape recorded to enable the researcher to get information on what took place during the discussion.

Using the written reactions, the student teachers discussed the case - both the content and the writing. This discussion provided opportunity for each student teacher to revise the written material to reflect on what he/she really had intended. At the end of the session, according to our discussion, the student teachers found the experience - writing the case, talking about it with colleagues, and thinking through both content and form - an exciting and informative one.

Before the student teachers ended the session, they were asked to exchange cases with a classmate. Then, as an assignment, they were asked to write solutions to the open cases and reactions to the closed cases. Open cases involved unresolved dilemmas while closed cases centered on dilemmas with resolutions. Student teachers were encouraged to think of their solutions and responses from multiple perspectives: no one common solution is necessary or desirable. This was to underscore the idea that educational problems typically have many possible solutions. They were also asked to write comments on any of the following (Nichols, Tippins, and Wieseman, 1997).

- Their interpretation of the problem
- The solution they recommend
- Explanation of why they think their solution is correct
- Any moral or lesson they think they can draw from the cases
- Their comments may have also included any, or none of the following:
- Theories about teaching and learning
- Theories about human behaviour
- Their own experiences as students or teachers
- Experiences of friends or colleagues
- Common sense

For the third session, there was a large focus group discussion of the cases. Once again the cases were considered one by one. The solutions to the open cases were discussed. The merits and drawbacks of solutions suggested were taken into consideration. The written reactions to the closed cases provided a good springboard for the discussion about the case. The purpose of this culminating session on case experience was to have a collegial case discussion in which student teachers joined heads to think and talk about the issues and dilemmas of their work as beginning teachers in schools.

Several student teachers revealed that in the writing of the cases, they chose topics about which they felt passionately. The writing helped them moved beyond their feelings to the cause of those feelings. Further, they told me that writing helped them clarify their response and focus their thinking, which, in turn, helped them generate possible solutions that were useful in solving the problem.

Primary data sources included written cases featuring dilemmas and tensions of science/ mathematics teaching and learning, transcripts of small group and focus group discussions, written solutions to the open cases and reactions to the closed ones, and transcripts of participants' reflections.

DATA ANALYSIS

Data generation, analysis, and interpretations were ongoing throughout the study. I analyzed the cases independently by first reading through all sixteen, then rereading and taking notes in different but complementary ways. I also examined the reflection processes and outcomes as they were experienced and discussed by each participant and as they were revealed in the transcripts of small group and focus group discussions and transcripts of participants' reflections.

A sample case with the respective issues raised in the conversations and participants' reflections were included in the subsequent sections to provide answers to the research questions. Pseudonyms were used throughout this paper.

What Were Learned from the Case Experience?

In science and mathematics education we encourage both prospective and practicing teachers to engage on reflective thinking. Reflection "as an active process, is an essential component of professional growth" (Koballa and Tippins, 2000, p. 6). But while most science and mathematics teacher educators agree on the need for teachers to be reflective, they do not necessarily share a common understanding of what it means to be reflective. In this study, I approached the use of reflective thinking that is critical in nature (Zeichner and Tabachnick, 1991). This type of critical reflection is open to multiple perspectives; socially mediated; considers political, moral, and ethical ramifications; and identifies options, alternatives, and possibilities for future inquiry.

The narrative accounts that follow serve as a context for discussing the findings to the research questions. Having cases as the foci of discussion deepened the understanding of the complex issues that impact secondary science and mathematics teaching and learning at West Visayas State University. While the researcher focused on both the case experience process and the content of all case narratives, she highlighted one case in this paper to illustrate the kinds of mathematics learning that were generated through case experience, and of what significance is this learning.

The narrative begins by looking at how one participant's written case reflected dilemmas of secondary mathematics teaching, what sort of critical

reflective learning was generated and how the participants see the value of such learning.

It was a January afternoon, and time for the third and culminating session for this case experience. All the sixteen student teachers were gathered at the Student Teachers room to start the session. After several days of writing solutions to open cases, reacting to closed ones, and reflecting on their own, the participants were anxious to discuss what they have written. One student teacher spontaneously led a song to set the mood of the group for discussion. This is a typical fashion among Philippine schools to start the class session with the singing of a song.

When the song ended, Marjorie was invited to read and share her case to the group. She willingly stood up and began reading.

Narrative Account # 1. Why Can't We Do Addition and Multiplication in the Same Manner?

I had a lesson on multiplying fractions with my first year high school students. We had taken several examples and everybody seemed to be doing well. One student, Rene, who usually made several errors on addition of fractions had made some improvement. We reviewed the relevant rules and we did some extra problems. Everybody, including Rene, seemed to understand the rules and used them correctly.

After class, Rene came to me and asked, "I understand the rules that we use in class really well, but I don't understand why the rules for addition and multiplication are different?"

"What do you mean?" I asked.

"When we did addition like $3\frac{1}{2} + 2\frac{1}{4}$, we added the whole numbers and then we added the fractions. Now in multiplication, as in $3\frac{1}{2} \times 2\frac{1}{4}$, you told us to convert to improper fraction form. So that would be $7/2 \times 9/4$ which gives an answer of $63/8$ or $7\frac{7}{8}$. Could we not do as what we have done in addition? Like say, 3×2 plus $1/2 \times 1/4$.

"Okay, now what do you get?"

"So that would be $6\frac{1}{8}$."

He seemed somewhat surprised that the two methods produced different answers. "Oh, I see," Rene said (but seemed not convinced) and started to leave the classroom.

Marjorie's case generated a lively discussion among the participants. One of the reasons why her case was chosen is due to the fact that her story is one that addresses a very specific issue on the teaching of content in the classroom. Several other cases address problems like discipline and classroom management.

In the above case, a student was trying to relate an algorithm he learned before to the present lesson but it just didn't work. He wanted to know why it didn't work. The teacher showed him that his algorithm didn't work, but the teacher failed to show him why his algorithm didn't work leaving the student still puzzled because he still did not see the error in his own procedure.

As we discuss Marjorie's case, we wondered how important it is to show why something didn't work. But as the discussion progressed, we came to a consensus that knowing why something didn't work is actually part of understanding why something else did work. As a cooperating teacher, I wondered how Marjorie's mathematics teacher preparation has laid down groundwork to prepare her solidly to tackle issues concerning mathematics content.

The narrative continues to explore how case sharing provided the participants an alternative professional development experience. Several issues emerged from the focus group discussion. The researcher decided to form a table to highlight these issues and to visually re-present conversations drawn from the transcripts of focus group discussions. These excerpts from the focus group conversations are the group members' expressions of their learning from their case-experience.

Table 1
Expressions of Issues and Case Experience Reflections

Issues Expressed from Conversations	Case Experience Reflections
<p>Mae brought out this idea: "I think it would be helpful if a real-world problem will be used in understanding the problem."</p>	<p>Agnes shared this view: "That is a good suggestion... It seems simple...but I find it difficult to come up with a problem. I don't know." Agnes' view points to us the fact that in some instance, teachers would be struggling to find a word problem that fits a given problem. If they do find one, it would be pretty much contrived.</p>
<p>Eden however seemed skeptical about the idea: "But why do we have to start a lesson on multiplying mixed fractions with a problem that the students have not seen before. I think they will understand better if we show them how to do it first."</p>	<p>Karen's reflection points out the difference between the conventional way, "tell-them-how-to-do-it-and-then-have-them-practice" approach and the constructivist approach. "Students find it more meaningful if the lesson is given as a problem...For me, telling them how to do it is less meaningful. They just memorize the procedure without really understanding."</p>
<p>Racel thought of previous skills learned: "I think we should look at the prerequisite skills to multiplying mixed fractions."</p>	<p>As they were compelled to rethink of the prerequisite skills, Lorna and Maribelle gave these reflections. "May be we need first to review how to multiply a whole number by a fraction. We should let the students review how to multiply a fraction by a fraction"</p>
<p>Zeny was thinking otherwise: "But why do we really have to spend time thinking on a certain procedure that doesn't work?"</p>	<p>Dulce and Ben were of this opinion: "Showing that it [the procedure] doesn't work will actually help the student understand why another procedure works. I think it is part."</p>

Alora voiced her own practice:
"In my case, I always show to students alternative ways of solving the problem. I always tell them to come up with their own solution. In this way, we can explore several methods of getting the correct answer...And my students like it."

Several student teachers concurred the idea of showing alternative ways of solving the problem when they said: "That will show to the students that in problem solving they can have several solutions and also some problems have sometimes more than one correct answer." According to the student teachers, this will clear the notion that in mathematics there is only one correct method and probably one correct answer.

Discussions of Marjorie's case prompted a realization on the participants about their responsibilities in responding to students' curiosity. They argued that the fact Rene came forward to ask question is an indication that the lesson is important to him. Several student teachers upheld the notion that they should not discount the importance of any single question raised by the students.

An issue as to what skills are prerequisite to multiplying fractions emerged. Some participants went further than this. One question raised involved curricular issue. Some wondered how significant is the algorithm for learning higher mathematics. How might the learning of this algorithm be useful in our daily life? As teachers, how much time are they willing to spend on this algorithm?

Narrative Account # 2. Creating a Reflective Science and Mathematics Teaching and Learning Community

When this research project was initially conceptualized, the objective was to have student teachers write and respond to classroom cases about their teaching. It was assumed that the content of the cases would serve as windows on dilemmas that science and mathematics student teachers encounter in secondary classrooms. However, as the team members became more involved in the case discussions and as the team members went deeper into the dilemmas and issues, the very nature of the learning experience with each other became the interesting situation to look into. As a researcher, one begins to examine one's position as insider within the re-search process rather than as researcher from a conventional research perspective. From

this vantage point, I viewed the re-search in student teaching field experience as a collaborative venture, heightened by our reflecting and learning together.

A central idea to our case experience is that this research is one that creates a community of learners. The community metaphor in this sense is given a good description by Roland Barth (1990) in his book, *“Improving Schools from Within”*. In his text he aptly emphasizes the importance of the concept of community.

...I would want to return to work in a school that could be described as a community of learners, a place where students and adults alike are engaged as active learners in matters of special importance to them and where everyone is thereby encouraging everyone else's learning. (p. 9).

This was the first time student teachers in this group had this case experience. In fact seeing science teaching through dilemmas was also a new experience for many teachers (Arellano et al., 2000a). Marmon a science student teacher shared how he felt about the whole experience.

“It surprised me how I was able to reflect on a dilemma I faced in my teaching, write about it and discuss it openly with my colleagues...it's the first time we did this [case experience] and it made me feel a little secure thinking that I am not alone. Each of my fellow student teachers has her/his own story to tell. The first few days of my student teaching were really difficult for me. But when we [student teachers] started sharing our classroom stories, I gained confidence to face challenges in my teaching profession...I felt being a different person after I have thought deeply into the issue/dilemma I have encountered in the classroom. I feel this activity is very important because this is the only way we can understand better our students, our profession, and ourselves. So I am in favor of doing case studies from now on.”

It is evident that case experience was an “enlightenment and developed among the participants an attitude of sharing and being open to each other...and case experience initiated the process of growing together as professionals and friends ultimately building a teacher learning community” (Arellano et al, 2000b). I should like to characterize the community that we have formed as a reflective science and mathematics teaching and learning community. The student teachers were learning through active reflection.

Students who are learning in professional settings are active most of the time in that they are engaged in practical work (Shulman, 1997). The student teachers were engaged in active learning in that they were writing, analyzing, sharing information, diagnosing, arguing, and challenging one another's ideas. Case experience has provided student teachers with the opportunities and support for becoming active agents in the process of their own learning. We all know that authentic and enduring learning occurs when the learner is an *active* agent in the process.

The discussions of cases gave student teachers a chance to reflect on their own science / mathematics teaching problems and to realize that ideas for dealing with their dilemmas were available from their fellow student teachers. The different perspectives student teachers brought to discussions revealed several possibilities for analyzing and responding to problems. For one student teacher, the case experience revealed science and mathematics teaching and learning as culturally-influenced practices: "I realized that teacher's behaviour can affect the learning of the student...When the teacher is very encouraging, the students are motivated to learn. But we are all different persons. Even in our discussions, we have different points of view – different perceptions." Such insights were extended by some student teachers to re-consider and to re-structure how science and mathematics teaching and learning should take place in their own classroom, as one science student teacher revealed: "I will also apply this method [focus group discussion] in my science class. Children need to discuss. I think discussion will encourage creativity and critical thinking... There will be a lot of observations when we conduct our experiments." Another mathematics student teacher commented: "Doing discussion, just like we did last time, has made me develop a sense of belonging. We were able to see our problems in different perspectives and we developed the ability to laugh at our own mistakes...We were also able to overcome our feelings of insecurity." All these comments reveal that a sense of "community" developed among participants through the case experience.

Collaboration has educational advantages. When students reflect on what they thought they already knew, collaborative exchange eventually deepen their understanding of an idea. So if we want students to learn ideas, concepts, and principles that will be robust, that will be deep—the way to

temper those ideas is through reflection and through interaction and collaboration.

Student teachers who were participants to this study indicated that the case experience provided them the opportunity to look at their problem or dilemma in multiple perspectives through the comments and solutions shared by their peers. Elna, a mathematics student teacher described the potential of case-based pedagogies in science and mathematics education as a way to look beyond observable science and mathematics teacher practices — to consider a more intangible aspect of being a science or mathematics teacher:

I am also in favor of writing case narratives and share with each other because in that way, we don't only learn the technical aspect of student teaching but also the psychological part. Working collaboratively with one another makes one a better teacher, a teacher who can relate well to others. It is very difficult to teach if you have a deep set of problems within you. It is relaxing when there is somebody who can understand your problem — how you should handle your problem... If there is no activity such as this, I will feel to be a problematic person. But from this sharing, we gained encouragement from each other. We have developed a relationship. We became more open to each other and so we become stronger persons to pursue our goals for teaching.

Clearly, Elna's comments elucidate the reflective, collaborative learning advanced by Shulman (1997, p. 11): "This kind of learning is not exclusively cognitive or intellectual. There is a significant emotional and affective component that inheres in such work. When students share a passion for the material, authentic and enduring learning occurs, are emotionally committed to the ideas, processes, and activities, and see the work as connected to present and future goals."

Indeed, there is a special quality to the affective responses that develop within individuals who have become interdependent members of collaborative groups that function as learning communities. It is in this framework that we define the reflective science and mathematics teaching and learning community that we have formed.

IMPLICATIONS FOR SCIENCE AND MATHEMATICS TEACHER EDUCATION AND RESEARCH

There are significant implications as we reflect on what this study of case-based pedagogy means to science and mathematics teacher education, reform, and research.

The pre-service science and mathematics teachers in this study developed an awareness of assumptions that influenced how they made sense of dilemmas they encountered in their teaching. It is also clear that the use of narrative inquiry to explore our lived experiences has brought to fore the fact that case-based pedagogies stimulated aspects of critical reflection involving open-mindedness, creativity, and sense of responsibility. One of the interesting things about case-experience in a narrative inquiry is that it captures pieces of lived experiences that initially existed solely within the life of a single individual and weaves that solitary experience into a coherent story of lives of a group of people.

Case discussions prompted participants to pose problems, analyze situations and argue the benefits and drawbacks of various alternatives. It required student teachers to make assumption, distinguish between relevant and irrelevant points. Furthermore, through case discussion, participants were able to raise the basic issue; probed deeper beneath the surface of things; pursued problematic areas of thought; discovered the structure of their own thought; developed sensitivity to clarity, accuracy, and relevance; arrived at a judgment through their own reasoning; and identified their claims, evidence, conclusions, questions at issue, assumptions, implications, consequences, concepts, interpretations, and points of view; all these at the heart of critical thinking (Paul, 1990).

One important source of teachers learning to teach is experience. How teachers learn, and from what or from whom are questions of great concern in the current efforts for teacher education reform. For teachers, we recognize the fact that, to learn from experience is quite difficult. Teachers have little time to think about what they do and much more little time to write about what they do. But we know that to learn from what we are doing, to learn from our experiences, we need to reflect on them for us to be able to make sense of them. Our continuing research effort for teacher

education reform should focus on teachers' narratives as central to the experience of becoming a teacher.

Writing about teachers' classroom experiences is one way to foster teacher learning from what they do. In this study, the student teachers indicated that writing classroom cases helped them to understand the dilemma they described, including its complexity, and the consequences of each of the solutions suggested. By sharing the cases with peers during the conferences in which they actually taught each other, their learning was further enhanced. Student teachers who wrote cases involving classroom discipline are able to look at children who seem to be problems on discipline not as "problem students" but as "students with problems."

This study created an opportunity for us [participants and researcher] to think more critically about our teaching and research. Narrative inquiry provided a way for us to reflect on our experience and report on our work and which to us symbolized a departure from the traditional way of perceiving research and moving towards an alternate stance or definition. By creating narratives, it helped us to examine our teaching practices and experiences. The reflective learning community, that we have formed, provided us an opportunity to become aware of how our teacher preparation background and ideologies shape our practices as science and mathematics teachers. This led us to pose several questions in our teaching practices and research such as: How might case sharing between experienced teachers and novice teachers be carried out? What sort of relationship is needed between experienced teachers and novice teachers to develop critical and reflective communities of learners through case-based pedagogy?

Clearly, casework or writing cases and sharing with colleagues will help equip student teachers with the capability of reflective practice, including the ability to think critically and being creative practitioners. Only by understanding what they do that student teachers would be prepared to assume their leadership in schools.

After all, "it is teachers who, in the end, will change the world of the school by understanding it" (Rudduck, 1988).

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