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MISSION STATEMENT

Thinking Classroom serves as an international forum of exchange among teachers, teacher educators, and others interested in promoting democratic teaching practices. The publication encourages professional development, research, and reflection. *Thinking Classroom* features articles that foster learner-centered teaching strategies including critical and creative thinking, active and cooperative learning, and problem solving. The journal also publishes articles about the institutional structures that support these practices.

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Writing for *Thinking Classroom*

Thinking Classroom (also published in Russian as *Peremena*) serves as an international forum of exchange among teachers, teacher educators, and others interested in democratic teaching practices. It seeks to encourage professional development, research, and reflection. Authors are invited to submit articles that focus on active inquiry, student-centered learning, alternative assessment, and other aspects of educational change. Due to the international nature of the journal, articles should address issues that appeal to a wide audience, and terms or examples that are specific to a particular country or region should be explained in the text.

Thinking Classroom strives to maintain a balance of practical and theoretical information. The writing should take the form of a narrative, rather than a formal research report. Examples from classroom experience, quotations from colleagues or students, or examples of students' work can help communicate ideas to journal readers.

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A Journal of Reading, Writing and Critical Reflection

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Letter from the Editor

Teaching is too hard to do alone

Welcome to an exciting new issue of *Thinking Classroom/Peremena*. I'm delighted to share what, for me, is very happy news: beginning with this issue, two new editors have joined the team. Natalia Kaloshina from Ukraine will oversee the Russian version (*Peremena*), and I, from Canada, will do the same for the English. Our challenge will be to maintain and build on the high standards set and achieved by the previous editors—fortunately, Wendy Saul, Olga Varshaver, and Daiva Penkauskiene will remain closely connected to the journal, to assist and inspire. As you will see as you dip into the pages of this issue, the commitment to providing a richly stimulating forum of exchange for educators from around the world remains unchanged: *There is so much that we can learn from each other*.

Teaching can be surprisingly isolating... and sometimes insulating. This sense of isolation is often compounded for those trying to make changes to their practice, to "the way things are done here." No matter who or where we are, our visions of change need affirmation, constructive scrutiny, and ongoing support if they're to survive and thrive in practice. No matter where or what we teach, we can always benefit from the challenge of fresh ideas and new approaches. This is one role this journal seeks to play: to offer affirmation, practical advice, research evidence, strategies, and collegial input to those seeking ways to make their teaching more participatory and critically framed. One goal taken very seriously is to make our readers aware that they are not alone... that they are in the company of colleagues.

A while ago I read an article by Donald Graves, the respected American teacher/researcher of writing, which struck a chord with me that keeps sounding. He was curious about what made it possible for some teachers to sustain their professional energies and enthusiasm for teaching and to continue to grow as teachers—despite the incessant demands and pressures—while others seemed to have lost their satisfaction and efficacy in the role. Identifying teachers in the former group, he asked them the reason. Turns out, collegial support was key. Having *even just one* like-minded, trusted colleague with whom they could speak frankly about their teaching aspirations, struggles, successes, and questions made all the difference—made it possible to reflect, refresh, and refuel. This didn't have to be someone teaching at the same school, at the same level, or even the same subject. What seemed essential was being able to connect with others who could understand, value, and helpfully critique the vision for teaching that their colleague was striving to make reality in his/her classroom. I once saw a bumper sticker that proclaimed, *Teaching is too hard to do alone!* It is. And too important.

Working as a volunteer trainer with teachers in Macedonia and Armenia connected me, at a time when I needed it, with colleagues as deeply committed to active pedagogy as I was. Those experiences energized me, put all my beliefs about teaching to the test, and pushed me to clarify and reaffirm what I was trying to achieve as a teacher. It was the richest professional development I'd ever encountered. Through *Thinking Classroom*, I feel I remain in touch with teachers who care about the things I care about. Such connections, whether with colleagues across the hall or across the globe, matter and make all the difference. There is so much we can learn from each other, so much we have to share.

One of the best ways to support the learning of students is to support the learning of their teachers. Recognizing this, four of the articles in this issue focus on professional development. Three report on the use of powerfully instructive strategies to deepen analysis and reflection: Ivason-Jansson and Gu, from Sweden and Tuska, from the USA, examine the impact of the collegial unpacking of classroom observations; while Pesci, from Italy, describes an innovative application of metaphoric and theatrical techniques to help teachers reveal their feelings and attitudes towards mathematics. In a disarmingly honest piece that invites readers to join the discussion, Zair-Bek and his colleagues, from Russia, reflect on the many challenges facing those of us who purport to teach adults. Thankfully, as well as highlighting the dilemmas, they offer seasoned advice for avoiding or surviving some of the inevitable pitfalls.

One of the other major goals of this journal is to provide our readers with a rich array of strategies and resources relevant to, and readily adaptable across, a range of contexts. In this issue, Lisenco, from Moldova, describes a process for including students in the development of rubrics to track classroom debate; Courtney and her colleagues, from the United States, discuss results from their ongoing research on comprehension strategy instruction; and Brozo describes the use of web quests to focus and facilitate student access to primary documents via the internet. Each of these articles demonstrates the power of a concrete example, particularly when that example is illuminated with insights gained through reflection on implementation.

Our hope is that as you read through these pages you will find many ideas that will enrich your work with your students, and that you will want to share with colleagues. My hope, as new editor, is that you will be inspired to write about *your* experiences and research in an article for this journal. We want to hear from you... *and we're confident you will want to tell others about all this journal offers.* One of the new areas we are developing is our website—we are exploring easy-access interactive platforms to make dialogue more immediate, responsive, and participatory. As well, we're planning to alert our subscribers to interesting resources and websites by featuring and rotating links on our site. So please encourage anyone who might be interested to visit the website and to join us as a subscriber (http://www.ct-net.net/rwct_tcp). They'll find themselves in wonderful company—among friends.

Alison Preece

Alison Preece

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Natalia Kaloshina is Assistant Professor at Sevastopol National Technical University (Ukraine). She is a professional editor (nonfiction and academic books) and a literary translator (books by W. Collins, S. le Fanu, V. Naipaul, J. Austen, I. Murdoch, A. Christie, L. Stewart, etc.). She has translated for the journal and for the RWCT program since 2001.

Ewa Ivason-Jansson, Limin Gu

Reflection and Professional Learning

An Analysis of Teachers' Classroom Observations

Introduction

In recent years, there has been an increased interest in—and demand for—improving teachers' professional knowledge through research by the teachers themselves on their own practices. There has been much discussion and an increased focus on various inquiry-oriented approaches and the use of terms like *reflection*, *action research*, and *teacher empowerment* in teacher education. However, this effort has mainly been at the pre-service level and emphasizes the development of capabilities among prospective teachers (Mills & Satterthwait, 2000; Reid & O'Donoghue, 2004). Little consideration has been given to applying these strategies to advanced in-service teacher education programs, where the focus has mainly been on studying theories or "renewing" teachers' knowledge.

Since the fall semester of 2002, the teacher education faculty at Mid-Sweden University has developed a new five-credit course, "Learning through guidance and reflection," for supervisor-teachers within an in-service teacher education program. (These teachers are responsible for supervising the pre-service teacher students from our university in their school-based practice in schools or kindergartens.) The focus is on communication in the classroom and interactions among teachers and children in relation to the children's learning. According to the communication tradition in the school world, the teacher presents information to students; thus the communication process is controlled or governed by the teacher, who also has an overview of the whole and the power to control the situation. The aim of this course is, in a more structured and systematic way, to help teachers develop a kind of insight into these important educational and pedagogic issues, with the aim of changing the pattern of traditional classroom communication by reflecting on what has occurred in the classroom.

In this study we try to find out what the teachers have learned through the course, where the observations and reflections on practice have been taken as a "red thread" throughout the teaching and learning process. Our focus is to describe, explain, and analyze how teachers have experienced the knowledge supplied by observation and reflection, as well as their own understanding of the function of action research in their professional development. Finally, as teacher educators, we are also interested in our role as facilitators for the teachers in this learning process, and in how to develop our course in the future.

This paper addresses the following research questions:

- Why and how can teachers use their own activity field as the departure point for their learning?
- What can teachers learn by observing their own educational field, and how does changing position from a teacher to an observer, affect understanding of educational practice?
- Why is reflection (both individual and group) important for teachers' learning?
- How do teachers reflect on their reflections on practices?

This is a small-scale evaluation study based on materials we collected from the course offered in the fall semester of 2003 and the spring semester of 2004, which consisted of notes on 56 observations, including the comments and reflections on observations by the teacher participants, and 48 evaluation reports. We also used materials such as the notes and documentation of the group discussions, presentations, and evaluations of the participants by the teacher-educators in the course. One author of this paper has followed the whole process of the course and done some documentation while carrying out and participating in every course activity. This can be seen as our reflection on the teachers' action, as well as an evaluation of our own work in managing the course.

Professional practice as the departure point for teachers' learning

The problems of educational practice do not present themselves as well-formed structures to which teachers can apply a ready set of technical procedures. In fact, teachers construct the problems out of particular situations and from familiar theoretical ideas and techniques (Schön, 1987). As the situation changes, other theoretical assumptions and practical techniques are brought into the construction of the problem. To be aware of the situation, and of the evolution of the problem, is a prerequisite for generating and identifying the problem. A concrete situation thus becomes a departure point for reflection. People learn through acting with and on the situation; in other words, an active knowledge process is a result of interaction with a complex activity (Schön, 1987; Alexandersson, 1998).

Furthermore, to reflect critically upon their practice makes great demands on individual teachers. It is difficult for even the most ambitious and experienced teachers to consider their own development as pedagogues during communication and interaction with pupils. Teachers need the knowledge and skills as well as the time to reflect on what happens in their professional practice. The daily task of the teachers is to make educational activities work in a satisfying way. They always feel that they don't have time to stop for a moment and think about situations in the classroom—they are so occupied with solving practical problems and making things go as they have planned and as smoothly as possible. They think they already know what to do, without thinking about it before, during, and after their actions. Of course they do have some knowledge and ideas about education, but in many cases they are not able to describe and explain how they have used their knowledge and ideas in their actions—people know more than they can tell. The term *tacit knowledge* refers to this type of knowledge (Horvath, 1999). Although tacit knowledge is silent and cannot always be recognized, it has great influence on teachers' actions.

Bringing these ideas into our design and management of the course, we realize that the teachers who take this course have long experience working in kindergartens or schools and need to have theoretical as well as technical support to meet this challenge. We chose observation as the main tool to begin with, because observation in the classroom by teachers will contribute to an increased awareness by the teachers of what actually happens there; based on this, reflection, knowing, and learning are then possible. The following is a description and analysis of how teachers have carried out the observation assignment and what they have learned through the observations and follow-up activities such as documentation, presentations, and group discussions during the course.

Observation as a primary method

We began with an introduction to how we might use our own practice as a research object, and what kinds of instruments or tools we could use to extract the sequence from a daily activity. We also had, at the start of the course, a literature seminar and a discussion about the communication code and communication style in the classroom (Fuglestad, 1999), which we took as the focus of the observation or thematic task. We talked about language usage, body language, and other communications patterns, such as raising hands and waiting for one's turn, which could occur in the classroom. Also introduced were such technical skills as describing the classroom layout,

furnishings, and positions of teacher and pupils, and getting to know the classroom environment before starting the observation (Dean, 1992). We call this *situation description*. Dean argues that the furnishings in the classroom could affect the teacher's performance. The discussion by the participants themselves and with the teacher-educators on these topics worked as a part of their pre-knowledge for the coming observations. More importantly, we also challenged them to use the theory and pattern of communication as a theoretical tool to analyze the findings from their observations. In so doing, they would themselves contribute to creating new knowledge about their own educational activities, and the possibilities to change and develop these.

The teachers were required to observe children in their respective classrooms or kindergartens where their colleagues were giving lectures or carrying out educational activities. All observations were conducted within a time span of 10-20 minutes, according to the length of lectures or activities. The observations were so-called non-participatory observation, which means that the teachers as observers did not take part in the classroom activities. Their task was to pay attention to what actually happened in the classroom and to make field notes during the observations. They were also required to rewrite the observation notes afterward and to make some comments about what they had seen and heard, as well as write their own reflections on the actions during the observation. The findings and their own reflections on these findings were presented and discussed within the groups.

We found that observation notes were made in different ways by different teachers. Some of them noted all the classroom events in the form of running text description (using techniques such as key words, signs, and categories) and completed them after the observations. Some used both text notes and graphic maps (sketches) to display the location, the context, and the movements of the teacher and students in the classroom. Since communication was the focus of the observation assignment, the teachers as observers were aware of the importance of the interactions between teacher and pupils and among the pupils themselves. These interactions were expressed both by their language (speeches and conversations) and their body expressions.

Some things on which the teachers reflected during their individual observations were:

- individual pupils;
- relationship and interaction between teacher and pupils as well as among pupils;
- their relations to materials, subject matter, and contents;
- their attitude toward the object of learning but also toward actions;
- pedagogical characteristics where the way of teaching/learning/thinking is noticed.

A teacher in a classroom may pay more attention to the subject and the performance of teaching and thus overlook the details or other patterns of interaction with and among children. As observers, the teachers were in a different situation than they were used to. The observation allowed them to step out of the role of teacher temporarily and provided a kind of distance to see things they had not seen when they were teaching. As their position changed, so did their perspectives. They learned things about communication in classrooms that they had not discovered or not paid attention to and reflected on earlier. A teacher said: "I found (through the observation) that there were lots of things that happened in the classroom that had nothing to do with the teaching." Another teacher wrote: "It is good to observe and to see things that people normally don't see when they themselves are in action. I have learned, for instance, to distinguish the different reaction patterns of the children." This kind of discovery, new focuses and attentions, and changed perspectives may have great influence on their own work in the future. This was also mentioned by the teachers themselves, as we will recount later.

Reflection as an instrument for learning about one's own practice

Here is an example of observation notes and comments by one participant, Jag:

Primary school grade 2, three girls—Jenny, Kattis, and Lina (not their real names) solve a mathematic problem.

The teacher has divided the class into pairs. But one group consists of three girls. The teacher suggested that I could observe this group because "those three are the cleverest at math." The task of the group is to plan a birthday party by calculating how much it would cost to buy all the things needed for this party. When I come to the girls, who are sitting in a separate room, it has already been several minutes since they started the task. They have paper and pencils, and sit on their separate cushions. K. sits a bit away from the other two.

- K. begins at once with a suggestion about what kinds of food they should offer at the party.
- The girls giggle all the time but it looks like they are not actually having fun but pretending to have fun.
- Every time K. comes up with some suggestions, J. and L. turn them down by offering different suggestions. All three seem to have different ideas about what a party should be.
- L. just moved to this school two weeks ago because the village school she went to was shut down.
- J. started in this class in August, so these girls do not know each other so well.
- The following records the numbers of their speech acts (registered by the method of one stroke for each speech act) during the whole discussion:
  J = 40 speech acts
  K = 79 speech acts
  L = 41 speech acts

The total time for this group discussion is about 15 minutes.

After many fumbling attempts from K., they finally decided to have a separate party for each of them. Then they started to argue with each other because of J.'s scribbling. When Jag was leaving them, the three lay in a pile and continued giggling, but Jag still felt that they did not actually have fun. Jag got the impression that these three girls, who were clever and speedy with definite opinions of their own (according to their teacher), were used to running their own race, and placing these three in the same group led to a kind of competition among them. However, they had very different views on what constituted a great birthday party. After school their teacher said that these three girls had been unfriendly with each other when they returned to the classroom and the co-operation had not resulted in any plan for parties for them.

A discussion about the observation was held within the teacher group. The following questions were generated, developed, and considered: *What was the object of the mathematical task? How had the relations among the girls worked? What was the teacher's knowledge about the girls' mutual relationships, and how had these affected the process of planning?* (In this case the relationships among them led to the mathematical task being spoiled completely.) *What could have been done differently if the relationship among the girls had been known? Were there any indications that these three girls could work well together, or was their capability in mathematics the only criterion for the grouping? Could this problem have been discovered if the observa-*

tion had not been done? What consequences might there be if this kind of relationship between them continues? Is it ethically defensible to let the girls solve the problem on their own? Could the mathematical task be done successfully if the teacher had known the relationship among these girls and tried to work out the problem before? And if I were the teacher, what would I do? These discussions led to agreement that knowledge about the children's relationships is meaningful for making teaching and learning successful. It is not just a matter of the subject the teacher is dealing with; it is also a question of socialization of the children, the view of the children's development, and the view of the value and goal of education.

By reading the observers' writings and taking part in their presentations and discussions, we found that there are different stages of reflection. The first stage happens during the observation, i.e., *reflection in action* (Schön, 1996). Reflections are different because of the different situations and the different objects of observation. It is a kind of situated reflection that determines the level of reflection. The next stage happens afterward while the participant is re-writing the observation field notes and making comments; at this point, the feelings, impressions, considerations, and even the kind of inference or deduction of the observer toward the events are involved, and theoretical knowledge is used in analyzing the data. The third stage happens when the participant is accounting for, presenting, and discussing the findings from the observation with others in groups. More considerations and thinking are involved through reflecting on others' questions and ideas, as well as on the framework of professional theoretical references. The later two stages of reflection are called *reflection on action* (Schön, 1996).

There are also different levels of reflection. The first level is technical reflection in which the teaching and learning process, and possibly the means and method used in teaching, are the focus. The second level is practical reflection in which the assumptions of teaching are the center of attention. An analysis of the activities is related to whether or not the purpose of teaching is reached. The third level is critical reflection in which the ethical and moral aspects of the situation, as well as the development of the individuals, are considered. In a practical situation these three levels of reflection could happen in parallel and could exist at every stage of the reflection (see also Carr et al., 1986).

The above is one example of the reflections on educational activity by the teachers. By testing the use of observation in the classroom, the teachers have acquired not only the knowledge but also the technique of how to define and delimit the situation (Schön, 1996). It directs the attention to these delimited sequences and the alternative ways to interpret them. However, it is important to point out that we do not mean it is something dealing only with those logically delimited rational actions. On the contrary, observation should contain the whole situation, including context, interaction, and expression. The relationships and emotions that exist and are shaped by people in the classroom are very meaningful for *whether* and *how* learning is going to happen.

Teachers' reflection on their reflections

The teachers who took this course were challenged to learn more about professional knowledge through reflecting on their own activities to which the inquiry-oriented approaches were applied. During the course, they were required to make observations on classroom activities at their work places. They came back with reflections and experiences, and discussed their findings, as well as their feelings and experiences, with their classmates and the teacher-educators, and tried to gain a deeper understanding of the school practice. The following is a summary from the evaluations by the teacher-students themselves that represents their view on what they learned through doing observations in their own fields.

Almost all the teachers mentioned that it was instructive in many ways to observe and reflect on one's own educational practice. Observation provides not only the opportunity to see the whole situation in the classroom but also the chance to follow individual pupils and to focus on their behavior and actions or reactions. Furthermore, the conversation, interaction, and communication between

teacher and pupils and among pupils in the classroom gave the observers much information about what and how pupils think, understand, and learn. This information provides teachers with ideas and strategies about how they can improve their own teaching. As one teacher said: "All experiences change us as individuals. Observation has provided me with a changed view on what is going on in the classroom (and) in a group, especially in the interactions among the children." In answering the question of "to what extent is there a possibility for you to apply what you have learned during this course in your daily work/activity," 90.5 percent gave the answer "often" or "always." As one said: "To observe in the classroom provides us with a departure point for a deeper educational discussion within the work team." Another comment: "I am going to continue to conduct observations in the classroom because it gives us a joint starting point for discussion, which we could not get if we only talked about what we think."

Many of them have also mentioned that it is of great value "to see through the eyes of others" and to have "the change of perspective" that gives an opportunity to discover small but often meaningful sequences in day-to-day classroom activities—sequences that might be overlooked in daily work. Teachers become more objective, attentive, and also critical in understanding their pupils, their own role as teachers, and the learning process. Moreover, the value of observation increased when it was reported and used as a basis for questioning one's own activities. Some of the teachers, through the course, have already become aware of the lack in their own practice that they need to supply. They have become more critical in examining their own educational work. We have found that the teachers do need to formulate their own questions and give attention to the pedagogical issues that can contribute to their own learning and thus lead to an increased understanding of the learning process of the children.

Teachers have also pointed out the importance of discussing with colleagues the findings from the observations. People have various focuses, opinions, perspectives, and interpretations, which result from their different experiences and knowledge backgrounds. Something that one person has experienced as "normal" may mean something totally different and special for others, and these different and complementary points of view contribute to a comprehensive understanding for all. People learn by reflecting on their own action but also from the reflections of others. The discussions within groups and reflections from others have led to new speculations and ideas. One participant said, "Observations make it possible to see how others act in the classroom, (which) is very instructive, and working up these (data) in the group with the concerned teachers has been very fruitful." Another commented, "We could have discussed the observations even more, it was interesting." However, two teachers mentioned that they had not learned anything new through the observations. These two had already been working extensively with documentation at work before they took this course. Observation is not new for them. But even these two teachers have found that the follow-up reflection activities within the groups are instructive.

The above are some results from the evaluation by the teacher-students themselves. Our ambition is to continue to develop the course, perhaps by combining observation with other research methods such as interview/conversation, diary, or focus group as a teaching/learning strategy in managing the course in the future. We also realize that observation, as a method, needs to be developed within this course. How to observe and what to observe depend on the purpose and focus of the assignment. The emphasis should be extended not only to how to use the method but also to theories and tools for analyzing the data collected. Working in schools or kindergartens today is a kind of teamwork that requires good cooperation based on common knowledge among staff members. Every small change and improvement by individuals will contribute to the process of development. Furthermore, for supervisor teachers, this kind of knowledge, ideas, and insights is of special importance in improving the quality of the school-based practice of teacher training.

For many, reflection on their own educational field is a way of self-discovery, which is significant not just for the

improvement of classroom practice, but also for teachers' professional development. The new curriculum for Swedish school education (Utbildningsdepartmentet, 1998) requires an increased responsibility for teachers in choosing strategies of working and methods of teaching that are adequate to the experiences and knowledge the students bring with them. Teachers are also responsible for students' reaching the national goals for education at different levels. This increasingly goal- and result-driven trend in the Swedish educational system imposes demands on teachers to acquire and develop a set of tools to study and investigate their own practice, as well as the analytical concepts to reflect critically on their own actions (Rönnerman, 1995). This course has provided them with the opportunity to become familiar with ideas and theories of reflection and the techniques for doing action research as well.

Summary

In this article, we explore the use of classroom observation by teachers as an important departure point for their professional learning, as well as a first step in introducing action research into in-service teacher training programs. Our focus is on what the teachers have seen during the observations, their focuses, how they think about what they have seen, what they have learned by analyzing the classroom situation they observed, and their own actions of observation. We found that the exercise of observation brings about an interaction with a concrete circumstance or condition, which produces a reaction causing reflection in which past knowledge and experiences are recalled in order to frame and explain the new phenomenon. Moreover, the teachers develop their knowledge in a more interactive and reflective way through the observations and the follow-up activities in which interactions between practical and theoretical knowledge, as well as between individual and collective knowledge, take place. In the process, teachers develop a heightened sense of their own professional work and develop questions and ideas about pedagogical and educational issues. We argue that this kind of reflective learning, based on well-planned and organized observation and follow-up activities, is not only a basic skill in doing action research, but also an important tool for teachers' learning and their professional development. It provides the opportunity for teachers to focus their attention on matters of priority and to feel empowered in developing their own professional practice and identity.

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Sergei Zair-Bek, with Valeria Mariko, and Irina Shvets

Working with Adults

The purpose of this article is not to present another in-service training course. There are different traditions of professional development in different countries. Rather, I would like to invite the journal readers to join the discussion among three colleagues from Russia about the principles and pitfalls of working with adults. Professional development for adults has become an increasingly significant component of, and contributor to, lifelong learning. However, teaching adults presents its own particular rewards and challenges.

In-service training as a burden

When your students are not simply adults, but teachers and faculty, you can be forgiven for feeling a little anxiety, as most of these people have great experience and a solid stock of theoretical knowledge. However, thousands of educators attend in-service training courses and seminars or retrain for new professions every year. It is much more difficult to teach such people as compared to representatives of non-pedagogical spheres. You are well aware that results of your work will be "retranslated" by teachers for schoolchildren and by faculty for university students. Therefore, the responsibility carried by those working in educational in-service training systems is very high.

As a rule it is easy enough to make up a group portrait of those whom we teach. Among those who come to improve their qualification there are people with lots of pedagogical experience, and their professional record allows them to feel quite confident of themselves—they are sure they will hardly learn anything new here. Our course for them is an opportunity to get a little rest from daily school routine, to chat with colleagues. They won't hesitate to express their doubts aloud or even to correct the facilitator.

Those who have started their teaching careers quite recently are also part of your audience. These people are education novices. Such teachers feel comfortable neither among colleagues, nor with students in class. Another special category is made up of school administrators. Finding themselves among teachers, many try to look independent and emphasize their status. They usually refrain from speaking much.

However, the main part of the group at in-service training courses typically consists of teachers with considerable pedagogical experience (5–15 years), the so-called "class-masters" (i.e., teachers officially responsible for a particular class and for monitoring their students' academic achievement and behavior). They are still looking forward to learning something new. Diligently, like schoolchildren, they write down everything the instructor says and ask for it to be repeated if they miss something they suspect to be valuable. This group is mainly composed of women who are rather tired of the daily school routine and have rather high professional self-esteem.

What can the existing in-service training system offer these people[1]?

[1] In the USSR teachers were required to attend state-run service training courses once every five years because subject content kept changing, curricula were updated, and new textbooks appeared regularly. Teachers improved their professional skills, leaving school for a couple of weeks, and returned with an official certificate. With the disintegration of the USSR, among other changes, in-service training courses were offered by universities, primarily colleges of education. In addition, there appeared nongovernmental centers that offered training workshops for teachers and faculty. However, in many post-soviet countries the government network (nowadays mainly municipal) of retraining centers for teachers has remained intact and continues to offer a compulsory course every five years.

Here are the comments made by my colleagues, Valeria Mariko and Irina Shvets, who teach in the Nizhni Novgorod Institute of Education Development (a municipal retraining centre)[2]:

> *… the professional development system in education is highly formalized and focused exclusively on delivering information in the form of methodological recommendations, instructions and statutory acts—however this system is supposed to be the main source through which everything new takes root in education! When the educational system had been focused on the "knowledge component", such a way of introducing the new was absolutely justified, but as soon as school was announced to be heading for a student-centered approach, delivering knowledge per se became obviously insufficient. Besides, faculty working in the professional development system are quite capable not only of mastering new pedagogical methods theoretically, but also of applying them in actual teaching!*

Is it possible to change anything? First of all, let's try to analyze typical erroneous assumptions about in-service training. I would formulate these as follows:

1. Participants are not aware of the latest changes in education, so we need to load them up with new information (i.e. methodological recommendations and instructions).
2. Teachers are adults, we needn't "play" with them using interactive forms of work. If needed, we can always tell them about the new methods.
3. We are always short of time, therefore we can't organize feedback or discussions.
4. Teachers come tired, so we shouldn't overload them; it is better to dictate everything and let them go home.

Such assumptions jeopardize any attempts at educational reform. As for alternative forms of professional development, in our context those are mainly training workshops within the framework of various programs (mostly originating overseas), and they differ strikingly from the state in-service training system. However, they do not embrace even one percent of all teachers. This is one of many conditions preventing the long-awaited innovations from becoming mass practice.

Searching for a framework

Let's return to the group of teachers described above (for some years I worked for the state-run professional development courses in Saint Petersburg, Russia, and my characterizations and observations are largely drawn from those experiences). My task is to acquaint them with new teaching methods and strategies and I have five seminar sessions to do this. The task looks a bit easier than it could be because everyone in this group teaches science (physics, chemistry, biology, or geography). Still, I expect lots of problems.

What should I start with? How do I engage everyone in the work? How do I select material that would be clear to teachers working in related, but still different, content areas? How do I structure the logic of the whole workshop cycle? What shall I use to illustrate the theory?

The first meeting corresponds to the initial (*evocation*) stage in the three-phase framework of a lesson. Striving for success I keep reminding myself of some important rules:

- There is no point in "mentoring" and trying to offer too much. Participants in in-service courses are mostly long-term professionals with a great deal of experience, rigid views of teaching systems, and their own pedagogical style. Any surplus of new theory will be ruthlessly rejected.
- For the same reason it makes no sense to insist on the unquestionable advantages of new approaches to teaching (in other words, educational innovations). Practitioners will be convinced only by the experience of their colleagues (preferably from their own school, city, or—at the very least—country) in combination with unambiguously positive results; and, subsequently, with their own successful practice. By the way, it is for this reason that the introduction of educational innovations goes so slowly.
- Simply to describe or even to model something is not enough. A teacher always needs to have reliable written materials at hand, for example, a guidebook or lesson plans developed by colleagues in the same content area.

[2] Quotes here and further on come from the article "Development of Critical Thinking in Educators' Professional Development" (Bulletin of Nizhni Novgorod University named after Lobachevsky, "Innovations in Education" series. Issue 1(6), 2005)

V. Mariko and I. Shvets: Introduction of a new strategy, method, or approach may be undertaken in several ways. Two of them are obvious. The first is to deliver information about a new method to the teacher (which includes telling about it and showing it in practice). Then a course participant reproduces it, more often than not making certain changes, adapting it to his or her own practice. Such a process is sometimes referred to as the "creative application of a new method." The result is supposed to be implementation of a new method in class and observing changes in students or, rather, their reaction to novelty— in this case, to a new method or strategy.

The second way implies modification of the process of teaching teachers. It is necessary to stimulate and track the development of such changes in the teachers themselves which later, as a result of introducing a new method, they will see in their own students. In this case a teacher not only gets theoretical knowledge about the expected changes, but also experiences them in practice. Therefore, in their own classes these teachers will not only be able to trace students' immediate reaction to novelty, but will distinguish other, more significant results.

Certainly, the second way of introducing the new is longer and more laborious. But it is also much more productive.

V. Mariko and I. Shvets used primarily the second approach in their course. While working with natural-science teachers, they focused on the content and methods for teaching these particular subjects. On the other hand, I was supposed to use both approaches described by my Nizhni Novgorod colleagues, as my course was initially planned by my employers as propaedeutic and, consequently, embraced material from across the curriculum.

Well, the first and very challenging problem was: **What to start with?**

At the first workshop teachers sat at desks like schoolchildren and opened their exercise-books. A few belated participants entered and began, in whispers, asking their neighbors about the topic. Some women begged me to dismiss the class as soon as possible. One lady at the back took out a pile of her own students' exercise-books to check…

I suggested that the audience think and formulate three to five most important goals of the teaching-learning process for their respective content areas. "Most important" was understood to mean those goals that all students without exception were supposed to achieve and use further in their life. Definitions had to be free of unfamiliar words. If such words occurred, the idea had to be reworded.

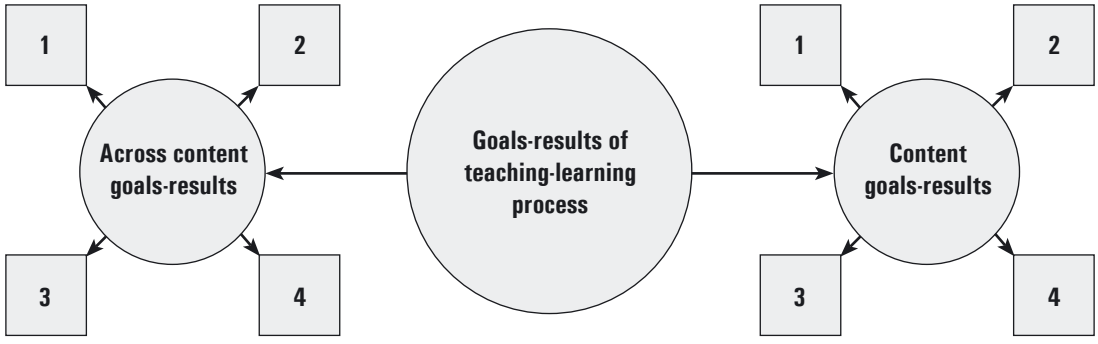
I will not go into detail describing strategies that may be used for this kind of task, because most of my readers are practitioners who are accustomed to active forms and methods of training. In fact, it does not make much difference if you ask the audience to work individually and then in pairs, or in pairs and then in groups while gathering and discussing such information. What is much more important for us now is that my question became a starting point for our joint inquiry. As a result, the teachers listed the following **goals-results**:

In relation to content:
- **across-content** (e.g., a student should be able work with information independently, using it for analysis, comparison, discussion and creative search);
- **content** (e.g., a geography student should know and be able to work with cartographical information using geographical concepts, to deduce and understand geographical laws).

In relation to type of activity:
- **cognitive** (e.g., a student should analyze natural laws independently, using physical, chemical, biological, and other concepts);
- **affective** (e.g., a student should feel confident and capable of independent cognitive activity and should display interest in creative scientific search).

Naturally, not everyone could formulate results of the teaching-learning process in three or five points. Among the answers we heard comments such as: "They should enter university without difficulties" or "They need to get used to working diligently". However, as a result of the discussion the group compiled a cluster of expected goals-results[3]:

[3] To save time and simplify the work, teachers may, in advance, prepare sets of cards with formulated goals-results of teaching-learning (based on materials known from pedagogical literature). These cards are distributed to groups and blank cards are included in the sets so that teachers just add ideas if they want to suggest something not mentioned in the main set. In this case the groups rate the goals-results, selecting the three–five they need.



Then the next two questions were offered to the group: *Which components of your pedagogical arsenal allow you and your students to move towards the goals-results you formulated and which components prevent you from doing this? What else do you need to move successfully towards these goals?*

In fact, these questions are a bridge between the background experience of the audience and the subject we consider at our seminars, i.e. innovative educational approaches. Answers to these questions (or new questions which may appear while they seek for answers) will allow teachers—right at our seminars—to identify where to introduce innovative practices in their own instructional courses. This will be done not simply for the sake of "entertainment" or "pedagogical experiment", but for the sake of achieving a particular educational goal-result or a group of such goals.

One of the well-known zones of risk at the workshops devoted to new educational approaches (even for skilled facilitators) is an attempt to immediately involve the audience in a new activity by asking them to experience or "live" a new method. Teachers do not always understand why they need to do this. I have heard the following many times:

- We have known this for quite a while. We are perfectly able to work this way and we already do work like this.
- What do we need your toys for? We are always pressed for time in class anyway, and you want us to waste precious time for God knows what?
- These "western tricks" are curious, but no more than that. In our situation (variants: in our system of education, in my subject, with our children) it will not be accepted, it is alien to us.
- Well, sometimes it is possible to try and "play," but you won't ever be able to use it as a system—maybe just fragments, separate strategies…

V. Mariko and I. Shvets have been engaged in promoting an innovative approach called RWCT[4] for years. They write: *We have developed a number of special courses to awaken interest in the audience. One of them is devoted to the values and semantic bases of the modernization of science education. After three days of work the participants, as a rule, notice changes in the own consciousness. Even on the second day they start asking: What are you doing with us? Why are these questions which have been practically insignificant for us until now (about values of science education), becoming interesting and important? Why can't we stop reflecting even when we leave the class?*

On the first day participants work individually, in pairs, and in small groups—everyone has to voice an opinion, listen to a partner's opinion, and develop a joint one. On the second day the main focus is on the methods of reading lengthy passages of text (of an instructional nature), discussing them, and presenting a joint, group understanding of their meaning. On the third day we search for arguments and ways to support them; the main focus is on discussions.

Actually, this course not only helps participants in mastering the new content, but also deeply motivates them for the course to follow, which is devoted primarily to the RWCT theoretical base.

[4] The RWCT program (Reading and Writing for Critical Thinking) is one of the innovative pedagogical approaches. It was developed by the US educators J. Steele, K. Meredith, and C. Temple on the principles of student-centered learning. Based on the *evocation—realization of meaning—reflection* framework, the program incorporates methods and strategies created and used in many countries of the world. More information about RWCT is available at www.rwct.net.

The next important task, which determines the success of the whole course, is to **logically organize the information** so that the relationships between key themes and ideas are highlighted.

When planning to attend a workshop, teachers expect a school lesson and faculty expect a university class. All of them want to see at least the theme of the session written on the blackboard, want to hear the goals of the session from the facilitator and to write down the key parts of his or her explanations. If we do not pay special attention to ways of helping the participants 'fix' the information presented, they will try to put everything down verbatim as they do at a lecture, and will ask you to repeat things word by word. If the facilitator organizes interactive work without paying any attention to ways of facilitating the acquisition and retention of the new information, and without leaving any time for it, participants get totally lost. Failure to attend to this factor risks undercutting the perceived value of the information presented because, for many, the value of the session is often measured by the amount of notes taken in class.

So, at the first of the five planned sessions, my in-service teachers formulated what was helpful for them and their students in achieving the goals-results of the teaching-learning process and what else they might need. Due to these reflections, our study of innovative teaching methods at subsequent sessions looked more like research, during which participants became acquainted with new information by searching for answers to the following questions:

- *What goals-results can be achieved by using innovative approaches as compared with the traditional methodological toolkit?*
- *What innovative approaches do I as a teacher use in my practice already?*
- *What is new for me and what can I use at my lessons?*

Now it is important to convince teachers that it makes sense to record only the information that will help them answer these questions. As for the theory, it is well covered in the methodological literature—one can buy it in a shop or find it on the internet. For recording information, you may suggest keeping logs or compiling individual portfolios.

Typically, for these participants, keeping a portfolio is a completely new way of recording the material learned. As I. Zagashev notes, it is a method for forming skills to analyze and evaluate the process of one's own development… (Zagashev and Zair-Bek, 2003) I suggest that my audience either use a notebook, dividing it into sections (allotting several pages to each—according to the estimated amount of information they will enter there) or just use A4 paper, putting the sheets in a file folder. Since each participant has an individual portfolio, they choose section headings to their own taste. In doing this they may use various approaches, for example, naming sections according to the type of information they hold: *New Concepts*; *Sources* (or *List of References,* with brief annotations); *Texts*; *My Questions to the Facilitator*; *Sharing with Colleagues*, etc. It is also possible to choose headings according to the goals-results and to distribute the new information correspondingly. It would be ideal if the portfolio that participants start compiling during the in-service training course is continued when they get back to their school or college. There they can fill it with practical materials (students' work, notes from faculty meetings, etc.), adding to the initial sections or creating new ones[5].

Another serious problem in designing a course is **selection of the materials and educational texts to be used**. Let's turn to the experience of my Nizhni Novgorod colleagues.

[5] If a facilitator has dared to introduce portfolios at an in-service training course, he or she should remember that it is practically useless to ask teachers to fill them out independently at home. Therefore it is necessary to allot time for working with portfolios in class. And it is very useful to discuss this process and its results together with participants. In the framework of a short course (five sessions) it is difficult to demand that students develop colorful portfolios rich with materials (alas, we are always—outrageously—pressed for time). However, you should use every chance to help your participants fill them out: Distribute some materials to everyone, including definitions of some basic concepts of your course, texts for work, annotated bibliographies of recommended literature.

V. Mariko and I. Shvets: Another special course developed to awaken interest in the RWCT approach has a three-day format, too. On the first day we offer a whole panorama of materials about student-centered approaches and their implementation in the instruction process by means of various sets of methods, RWCT among them. On the second and third days the underlying theory and methods are discussed by means of "unpacking" model lessons. The content matter for such lessons depends on the content area of the group we are dealing with (biologists, chemists, physicists, geographers). In fact, in most cases we have to work with texts of integrated character since the groups turn out to be mixed. Besides, the main emphasis in this special course is on the methodological aspect. Hence, the content we offer should be, on the one hand, new enough for the teachers to feel as if they were students, but, on the other hand, not so subject-loaded as to distract students from the approach being discussed. Within the framework of this course we always hold a reading conference based on the Thinking Classroom/Peremena journal. Here participants have a chance to learn about the effectiveness of the approach and get acquainted with the experiences, reflections and doubts of teachers and faculty from different countries. This is very important, as at this stage people are often unsure of themselves (Will I ever be able to do this? With the children I teach?.. Certainly, it is easy for them to say because conditions of life and work are very different there from the way they are here). When participants become aware that their doubts are in total accord with the doubts teachers have in various other countries (irrespective of conditions of life and work) and see that the problems are solvable, they become much more optimistic.

It is a difficult task to choose texts for the seminars. The text should coincide with the themes included in the curriculum. On the other hand, these texts should not be known to participants, so that the novelty aspect in dealing with new information is preserved.

Sources of information may vary from those found by facilitators to those created by participants. Mariko and Shvets suggest using a five-step writing workshop so that participants create texts on their own[6].

V. Mariko and I. Shvets: … a five-step writing workshop is used as a basis for writing a pedagogical essay. This workshop is important because an essay describing a pedagogical problem from participants' practice and possible ways of resolving it will be a required part of the course.

Strange as it may seem, **participants' questions** may also be considered part of the framework for constructing a course. Unlike children, who are often reluctant to pose questions to the teacher, adults are more assertive. A large number of questions testifies to the interest and genuine commitment of the audience, their readiness to analyze information and process it creatively. Therefore it makes sense to stimulate questions, even though some of them may seem too critical, too complicated, or seem to be driving the audience away from the initial plan. As a rule, participants' questions can be subdivided into several categories:

1. **Factual questions** come from inquisitive people who want to know more details connected with new information. You may either satisfy curiosity of this sort at once or provide references to related sources.
2. **Clarifying questions** are indicators for the facilitator. They help correct unclear explanations or instructions.
3. **Reflective questions** come from analyzing what is going on at the workshop in terms of methods and attempting to make the participants aware of the procedural implications for their own practice. For example: *Why did you (facilitator) stop group work at this stage?* Or *How important is it to use graphic organizers at this point?* These questions demand answers, but there is no need to hurry. Questions can be written down and discussed later, at the stage of "unpacking" of this or that methodical model that has been "played" out.

[6] The 5-step strategy for creating written text was suggested by D. Murray (1985) and D. Graves (1982) and adapted by J. Steele, K.Meredith and Ch. Temple for RWCT program. According to this strategy the process of creating the majority of content-rich texts passes through the following stages: *rehearsing* (gathering information for subsequent creation of written text), *drafting* (process of creative transferring of the writer's ideas based on the analysis of collected information, on paper), *revising* (improving the text without editing it for grammar or spelling), *editing* (stylistic, grammatical, and spelling changes and proof-reading) and *publishing* (presenting the created text to the audience).

4. **Modeling questions** (e.g.: *What if we try to use…at this stage of the work?* Or *What if students won't be able to do what we want with the help of this strategy?*). Expecting such questions, a facilitator needs to allot special time for discussion. It would be wonderful if in the search for answers practical materials were used (lesson plans, videolessons, articles describing similar experience, examples of students' work). Sometimes it makes sense to leave such questions unanswered and to ask participants to check them out in their practice.
5. **Critical or evaluating questions** are quite often aimed at embarrassing the facilitator. This is done by adults (seldom by children) who want to show how knowledgeable they are or by those who for various reasons are basically critical of the suggested solutions. However, at times these questions may indicate sound skepticism or doubt (e.g.: *Don't you think that students will simply fail to read such a long text for lack of time, and, thus, the strategy won't work?*). The most successful answers are taken from the concrete practical experiences of the facilitator or other teachers. These questions are valuable as they represent a real problem brought to light and inquiry may then be directed at resolving it, both during the sessions and in actual school practice. In any case, such questions should not be disregarded. They may then be addressed, for example, while conducting a session devoted to lesson planning or while presenting a video clip of a lesson.

Among critical or evaluating questions, the greatest challenge for the facilitator is presented by distracting and negative questions (*Do you seriously believe that your "western" toys will work here? Have you ever tried it out in practice before stuffing all this down our throats?*). Undoubtedly, you must be always ready for questions of this sort. In any audience someone will always pose them, in oral or written form. If you remember the principles: "You can never teach everyone" and "You needn't try to convince them of the correctness of this or that decision" then you will be able to use such questions as an opportunity for monitoring the mood of the audience. On the other hand, a constant negative impulse jeopardizes the work of the whole group. While training the group that I described in the beginning of this article, I had to look for ways of "using negative energy for positive purposes." I asked two teachers with dozens of years in class behind them, and with rather conservative attitudes towards innovative educational approaches, to become "experts." The group was considering some method or strategy, and those two were searching for well grounded answers to the following questions:

- *What do you see as possible weaknesses of this strategy in terms of achieving the educational goals-results you have formulated?*
- *How can traditional methods of instruction successfully overcome these drawbacks (give concrete examples from your practice)?*

The two experts wrote down the answers to these questions on their expert sheets and presented their judgments at the end of the session, when the group reflected on the work done. I won't say that after a full series of seminars these teachers totally changed their views, but one remark gave me some hope: *I want to try the method of expert evaluation in my class. I feel there is something in it*. After a while I learned that one of the two skeptics was applying the new strategies and methods quite actively. Well, life is full of surprises, including pleasant ones.

Open-ended planning

Planning such a seminar series is a relatively open-ended undertaking if the facilitator intends to take into consideration the opinions and questions of participants and the actual process of training. In this case planning will not be rigid—it will be to a great extent prognostic in nature and focused on flexible goals-results.

V. Mariko and I. Shvets: The tasks we set for ourselves as facilitators and organizers of RWCT professional development courses for middle and high school teachers are related to three basic aspects:

Aspect	"Filling"	Prospective result
Content	What do we mean by the development of critical thinking as an educational approach? Philosophical, methodological, psychological and pedagogical bases of RWCT. How is it related to a teacher's personal experience? How is it related to the national education practices?	Understanding and acceptance of RWCT philosophy.
Methods	Basic framework and the strategies used within this framework	Acquaintance, mastering and including in the participants' experience.
Interaction	Creation of conditions for self-realization of each participant and their effective interaction at different levels.	Formation of a group of co-thinkers.

Where can we find a place for the above-named aspects in a three-day series of seminars? Here is one of the possible ways to structure their practical implementation:

Order of seminars	Basic aspects		
	Content	**Methods**	**Interaction (with each other and with information)**
Seminar 1 "Evocation"	Development of critical thinking as an educational approach. Concept of critical thinking.	Active reading and writing (work with informative, literary and scientific texts)	- listening - hearing - transforming - getting to the core of things - establishing contacts
Interim meeting.	Practical implementation of material learnt at the seminar.		- visiting each other - analyzing results
Seminar 2 "Realization of meaning"	Traditional and innovative teaching and opportunities offered by the RWCT approach.	Group work. Discussion formats for instruction.	- establishing contacts - proving - persuading
Interim meeting	Practical implementation of material learnt at the seminar.		- visiting each other - analyzing results
Seminar 3 "Reflection"	Development of education (problems, solutions)	Strategies of collective learning. Writing strategies.	- discussing
Interim meeting and presentation of final work	Practical implementation of material learnt at the seminar.		- visiting each other - analyzing results of the whole training

What shall we call a result?

We are at the last (fifth) of the planned seminars devoted to professional development in the field of innovative education. The problem of how to bring things to a close is no less important than the problem of how to start. On the one hand, I want the participants to leave with the impression that the process they took part in was one of integrity and completeness. On the other, it is important that everything we have studied, discussed and argued about should become a new starting point for their classroom practice. So, we decide to "rehearse" a teachers' meeting (in Russia teachers often have to report to colleagues upon returning from an in-service training course) in the form of a "double round table." The content for discussion is connected with compiling portfolios. The internal circle is formed by participants who will discuss the sections they have filled, noting the most interesting ideas, definitions, and results of their personal observations. The goal of this group interaction is simply to exchange opinions without posing questions to each other, whereas the people in the external circle watch the discussion and prepare their comments. Later both internal and external groups will exchange questions and comments.

During the discussion we hear many interesting comments and judgments. Some folks believe that they have learned nothing new at the seminars whatsoever. Others believe that there was something new, but it was so organically entwined with their background experience that it was hard to define… and very individual for each of them anyway.

However, all statements of participants fit in the taxonomy suggested by I. Zagashev. He notes that acceptance of the new may happen at the following levels:

1. Whiling away the time (*I don't want anything… When will they let me go home?*)
2. Accepting individual techniques (*All this is, certainly, rather shaky. But I may try some nice tricks in class next week.*)
3. Accepting individual methods (*I may use the method shown at the model lesson while studying similar texts with my students.*)
4. Accepting as an approach (*I like the framework and think the strategies aimed at maintaining parity dialogue with students may be used in my practice.*)
5. Accepting as a philosophy (*I like the whole underlying idea that "my subject serves to develop thinking skills, and not the other way around." I realize that there are such considerations as curriculum, obligatory grading, "Children need to pass exams," "Where are the guarantees of academic progress?!" But it is interesting for me to try myself not only in the role of an ever-knowledgeable instructor, but also of a co-thinker*).
6. Accepting with subsequent methodological transformation (This level is reached by those few whose creativity cannot accept something without processing it into a totally innovative form. These people may modify what they hear into another new approach which does not have a name yet) (T. Galaktionova, et al, 1999).

V. Mariko and I. Shvets: During the three years we delivered these courses, a group of teachers was formed who displayed interest in the new approach. These teachers began to come more often—both to seminars and to individual consultations. First we discussed how to introduce separate methods, then sets of methods, later we began to trace the results of the training and plan lessons and series of lessons.

The next step in the process of professional development for this group was a problem-solving thematic seminar in lesson and course design… As a rule, such seminars are attended by teachers with a steady interest in new methods and an acute need to analyze, discuss, and share their own pedagogical experience…

At the next stage of studying a new educational approach more advanced activities take place as we develop participants' research skills in the field of education and methods of teaching. The RWCT approach allows training to be organized for defining a pedagogical problem, for goal setting, for developing hypotheses for pedagogical research.

Summing it all up, the main result of such a training series within the professional development system for educators is, first of all, a conscious (and, at times, subconscious) desire to reflectively reconsider their experience, find new opportunities for self-development and, finally, to change the existing system of working in class on the basis of a new vision of educational goals-results and ways to achieve them.

A very short conclusion

One of my workshop participants compared our course with moving upwards horizontally. I like this comparison. It precisely reflects the main principle of working with adults: When the available practical and theoretical base is extensive enough, its further expansion during in-service training gives rise to new knowledge. And only practice will show how useful this knowledge will be.

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Angela Pesci

Mathematics Teaching:
Toward a More Human View

Introduction

Working in collaboration with mathematics teachers I have carried out a number of studies in recent years mainly centered on cooperative learning, i.e., a way of managing the teaching-learning process essentially based on learners' resources. In this teaching-learning model, processes of scientific investigation are combined with the development of social skills: The objectives to be reached in the classroom affect not only mathematics learning, but also the social interaction among students involved. In the aggregate, this work (Pesci, 2002) suggests that teachers, in order to be effective, must take into consideration emotions, beliefs, choices, and resources of their students; the social construction of knowledge always involves the whole individual, and it can never be reduced exclusively to the mathematical knowledge of the teacher or student.

Our work in several classes has shown that when teachers meet major obstacles in teaching mathematics, they do well to focus on the relational and social aspects of teaching and learning. Secondary-school teachers, in contrast, attend almost exclusively to the pupils' cognitive evolution regarding the taught discipline, leaving interpersonal relationships aside. Fundamental competencies for effective teachers, I would argue, include knowing how to organize group work and being able to observe and develop students' social skills, including their ability to communicate with and listen to others, to intervene in a discussion without going beyond the limits, to respect and welcome others' resources, and to be able to share common goals. For this reason, we deemed it necessary to engage teachers in experiences and reflections on general themes such as communication, listening, and non-verbal languages. Only by starting with this work, personally crafted and owned by them, is it possible to think about successive classroom follow-up leading toward the improvement of the personal relationships that may emerge and facilitating progress on the educational path.

This article focuses specifically on the project we call "the stage in the classroom," an experience carried out with a group of secondary-school teachers and developed to support the kind of learning described above. The project combined the teachers' disciplinary knowledge of mathematics with a more personal dimension. Its aim was to develop through metaphorical discourse a deep awareness of one's own disciplinary and relationship-related resources as well as a welcoming attitude towards colleagues and pupils. Fundamental to this experience was the contribution of Anna Gallo Selva, who works in an actors' group and who also has developed activities to support learning in educational contexts. We began with two different skill sets: Anna's theater background and my own background as one who works with mathematics education problems. Together we hoped to offer participants a set of strategies that might build a positive attitude toward mathematics on the part of pupils, taking into account their physical and imaginative capacities as well as their individual histories and skills.

Background

Central to our project is an interest in metaphorical discourse. This discourse refers not only to verbal but also non-verbal communication, i.e., gestures, facial expressions, images, objects, and sounds. Verbal discourse related to the subject matter is recognized to be insufficient because it is linked directly to the rational mind, which alone is not enough to construct knowledge (Damasio, 1999, LeDoux, 1998). Thus, a deeper and more global involvement is needed in order to develop mathematical ideas. In this sense, metaphorical discourse perfectly fits this aim.

It is important to note in this regard that studies in neuroscience have highlighted the special functions assumed by the two brain hemispheres: The left hemisphere appears to specialize in logical, analytical, rational verbal language, whereas the right specializes in the language of images, metaphors, symbols—in a word the non-verbal. Knowledge construction is based on a deep interaction between the two hemispheres, and a large number of processes involve the non-rational part of the brain. In other words, rational and logical human discourse is based also on unconscious processes and often on emotional experiences (Damasio, 1999, LeDoux, 1998). In order to access and restructure one's attitudes and emotions, it is therefore necessary to access the right hemisphere, while reducing the left one's activity as much as possible. Hence, it may be preferable not to use direct logical reasoning, but rather a symbolic discourse, like the metaphorical one, which enables more in-depth communication with people (Barker, 1985, Watzlawick, 1984).

As regards relationships between a person (teacher, pupil, or other) and mathematics, specific studies and experiences tell us how this relationship is (or has been) often painful and a source of anxiety (McLeod, Adams, 1989, Schoenfeld, 1989). Therefore, a specific reflection on an individual's construction of his/her relationship with mathematics, facilitated by metaphorical thinking, might be useful in promoting the resolution of problems that arise during both school and extra-school experiences.

This might be particularly interesting for teachers, as fundamental actors on the school scene and responsible, even though unconsciously, for students' ambivalent feelings toward mathematics. Beginning with a reflection on their mathematical background, this might promote improvement, both on the relational and on the disciplinary side. Work of this type might well have important implications and follow-up opportunities in their classes, both because teachers may become aware of the importance of addressing their students' relationship with mathematics and because of the skills teachers themselves may develop in using metaphorical discourse.

The mediation of the metaphorical discourse in our project was designed, and later realized, at several levels: The first phase was realized through explicit recourse to some metaphors, verbally described. During the following meetings the translation of participants' emotions into metaphors took place at an artistic level, according to their suggestions, through several verbal and non-verbal languages, such as gestures, images, music, sounds, and objects. Finally, the whole experience, centered and developed around one's own personal relationship with mathematics as the taught discipline, became a metaphorical pathway for a successive elaboration, by the participants, of their own relationships with pupils in their classes.

Project description: "The stage in the classroom"

The "stage in the classroom" project involved eight middle-school mathematics teachers who were not mathematics graduates, but rather had degrees in biological sciences, natural sciences, and earth sciences. Their ages varied between 26 and 44. All had decided to participate in the project spontaneously, with the additional objective of a possible future link with their work in the classroom.

The project developed in 12 meetings, for a total of 40 hours spread over about three months. It was not carried out in a neutral space but in the everyday, eventful context of an ordinary classroom. So, as spaces and objects became more and more permeated with the professional history of each teacher, they were acquiring a new meaning: They were still the same spaces but they were re-interpreted in terms of new tasks.

The activity stemmed from an individual autobiographical questionnaire,

concerning the choice of the most suitable metaphor to describe one's own relationship with mathematics, referring both to one's history as a student and to one's reality as a teacher. The following is the list of metaphors among which participants were asked to choose (in case the proposed metaphors were considered inadequate, the teacher could list a sixth, personal metaphor):

1. *Being in front of a mountain to climb and not having suitable equipment;*
2. *Entering a jungle, with traps that can open up suddenly;*
3. *Participating in a long marathon;*
4. *A challenging game with myself or companions;*
5. *Being forced to play a boring game;*
6. .....

Starting from this instrument and resulting responses, the subsequent activity of theatrical expression was set up. From verbally expressed metaphors we moved to concrete actions: Each teacher was invited to identify a particular emotion linked to his or her relationship with mathematics and, with the help of a colored balloon, to find a gesture that could be used to narrate in a meta-verbal form his or her own emotion. The next step was to "offer" this emotion to others, establishing a relationship and engaging in a non-verbal dialogue, made of glances, perceptions, and exchanges of gestures.

Still on the non-verbal side, another proposal concerned the realization of dialogues in which gestures went together with an unusual sound emission: the use of natural numbers instead of ordinary language, again to stimulate empathetic listening. All these steps, so unusual and far from everyday classroom practice, took a long time to be assimilated and always needed moments of discussion and verbal exchange. However, they met the favor of the teachers, according to the following comments of those involved:

> *[Non-verbal dimension] brought to the surface many emotions and feelings linked to my school experience and this has been useful for a better understanding of my pupils, since I could see in them many things I lived in my own skin.* (L. T.)

> *The exchange (the balloons) has been very important, like the metaphor discussion, the breeding of the most diverse emotions with photos and the possibility to communicate without words.* (M. E.)

> *At first the non-verbal dimension has been difficult to live but gradually it became fun... This mode of representation helped to bring to the surface meanings that differed from those we wanted to express at the beginning. This had a lot more flexibility than the verbal mode.* (S.)

> *It has underlined the importance of non-verbal dimensions of communication of one's own messages to the others (especially pupils); it is important to reflect on how these aspects are essential (usually teachers do not care about this) and reflect on how to improve communication.* (F.)

The fourth and fifth meetings were completely spent on tackling and solving a mathematical task, i.e., the classic problem of duplicating the square: given a square, find another one with double the area. The eight teachers chose freely whether to work alone or with others, which strategies they would use, and how they could share their own solution with the group. We could notice a very positive collaborative atmosphere, a general attitude towards listening to and welcoming others, a variety of proposed solutions. It was clear that the whole group had reached a very positive result, also due to the exploitation of resources each one had made available to the others. "I think... that my idea about how mathematics can be shared and taught in a serene and playful way, starting from a simple meeting of people, has changed" was the comment of S. R., one of the participants.

After a short autobiographical work based on photography, we entered the core of theatrical work, linking back to all previous experiences: Having recovered the metaphors chosen in the first meeting, groups were formed by homogeneous metaphors, and simple dramatizations concerning each group's metaphor were constructed, to be represented later on the scene. We then carried on with practical acquisition of theatrical techniques characterizing "Playback Theater" in preparation for the final performance, a tangible synthesis of the whole path and an instrument suitable for involving a wider audience. In a "Playback Theater," members of the audience are invited to come forward and share their personal stories and emotions, while actors recreate these stories and emotions on the spot, through

the art of improvised movement, dialogue, music, and imagery.

During the meetings, interpersonal relationships became friendlier and everyone seemed to feel comfortable. Many aspects concerning individual participants emerged: their own life stories; amazement at unusual verbal communication (through metaphors and story-telling); perception of a possible non-verbal communication through gestures, actions, sounds, and lights, reflection on the playful, creative, and human aspects of mathematics; and consideration of a possible educational function of both performance and autobiographical reflection, with an acknowledgement of the cathartic role they play.

As the concluding step of the project, we proposed a questionnaire to all participants, because we deemed it important to collect personal reflections on the experience they had engaged in. The results show that participants were deeply involved in the experience, and that some crucial points were observed, ranging from personal to professional ones, with interesting reflections on the teaching profession itself, on individual relationships with mathematics, and on the social interactions that characterize the educational process. One of the teachers, S., said: "The experience has been very interesting from the relational point of view... It made me understand, sometimes surprisingly, the relationship of our colleagues with mathematics [and] their difficulties as students, and this can help us to be more empathetic with our students' difficulties. I mean that there are colleagues that have overcome their difficulties, graduated, and became mathematics teachers."

Central to our conceptualization was the notion of performance as self care. The use of theater for therapeutic and formative purposes harks back to the work of Jacob L. Moreno, who is considered the founder of psychodrama, a form of help born in Vienna in the 1920s for specific groups of disadvantaged subjects. This work later developed into different forms, all having the common objective of exploring psychic and relational worlds through action and scenic representation. Anna Gallo Selva, who collaborated in the project, chose "Playback Theatre," as the specific form of psychodrama we would use. "Playback Theater," created by the

American Jonathan Fox, one of Moreno's disciples, in the middle 1970s, involves engaging the whole group, including "actors" and "spectators", in the psychodrama. Together they construct the scene and make visible their stories, their hopes, their problems. Thus, the distance between actor and spectator is reduced, in some cases cancelled, and through this communication players become authors of their own transformations (Fox & Dauber, 1999).

Finally, it is essential to stress the importance the project gave to "autobiographical" activities, the retelling of one's own life history. Narratives about the self have been recovered in the last decade as an important educational modality both for students and teachers (Demetrio, 1999). Among the objectives to be pursued, a fundamental role is played by a positive development of interpersonal communication, reflection about oneself, acknowledgement and re-evaluation of personal facts and characteristics, an increased capacity for self-listening, and self-understanding and a consequent increased openness to listen and welcome others. "The re-elaboration and reflection...

touched my life experience widely, with interesting episodes emerging from the contributions of the group," said S., one of the teachers involved, while another, M. E., remarked that "the double student-teacher mirror can do nothing but increase the empathy and comprehension of the different moods of my students. The rethinking of my past life plays a role in the relationship in the classroom allowing a better comprehension and patience."

A detailed description of the project as well as of the ideas that inspired it can be found in A. Pesci (2003 a) and in A. Gallo Selva (2003).

It seems that the participants understood the need of personal reflection on themselves in view of a possible positive follow-up in the classroom, to be lived every day as if they were on a stage. On this stage both teachers and students give room to multiple communicational forms, with the double aim of constructing knowledge and re-elaborating one's own problems and the search for collective wellness. A few meaningful comments:

> *This kind of experience made it clear that to know a person (in particular a pupil) and his relationship with the discipline are much deeper things than what first impressions can suggest.* (L. R.)

> *It seems to me that this approach can have a great impact on the quality of relationships in the school environment.* (S. M.)

It is important that, in each classroom, proposed teaching strategies take into account the fact that the search for a bridge between disciplinary and cognitive aspects must also correspond to a search for body adaptation, welcoming the other, and organization of time, space, and non-verbal languages, so that our discourse may talk to the individual in depth, thus leaving a significant trace. This reorganization of mathematics teaching as a whole will be put into practice differently by different teachers, depending on their own willingness and ability to question their traditional ways, and according to different classroom contexts. Obviously it is a good thing to introduce such radically new modes gradually, experimenting with them along with the traditional ones, thus possibly avoiding the refusal of the class. The classroom can therefore be viewed as a privileged place for a cathartic action, moving toward a rethinking of one's own relationship with the discipline and with other people, starting with the teacher's work on him- or herself.

Concluding remarks

Following the described activity, another project was designed, with new teachers, with the aim of better articulating the work, especially from the theatrical point of view, and formulating a sort of "intervention package" for mathematics teachers. This material, now in progress, is meant to be made available to a wider audience of teachers, both in their pre-service training and in the perspective of continuing educational training. The collaboration between two different experts—the mathematician and the artist—is viewed as crucial: The complementary nature of the two different roles emerged as fundamental to merging aspects that pertain specifically to mathematics and aspects that pertain to the performing expression.

The innovative features of this proposal can be synthesized in the following points:

- The choice of working on teachers, as an indispensable step toward a real change in classroom educational practice, which should be more centered on pupils' resources and oriented to the construction of positive disciplinary and social relationships. The literature underlines how an exclusively verbal discourse is not enough for a deep impact on convictions (either tacit or explicit) and on teachers' behaviors (Malara, Zan, 2002, Damasio, 1999, Ruggieri, 2001). Direct experiences of meaningful verbal and non-verbal modalities seem to be indispensable for a fruitful construction of relationships with both the discipline and the group.
- The use of metaphorical discourse, ranging from verbal to artistic, in professional teachers' training. It is essential for teachers to know how meaningful this is for a global involvement of people in the educational process. The first questionnaire proposed was all about verbal metaphors to describe one's own relation with mathematics, and then the metaphorical discourse was widened, integrating the non-

verbal. Metaphoric communication should be experienced on both a verbal and non-verbal level.

- Attention to non-verbal languages (graphical, pictorial, gestural) both in the construction of mathematical knowledge and in the development of interpersonal relationships: The objective is to come to that unity of mind and body viewed as desirable by pedagogy and psychology throughout the educational path, but that needs recovery in the adult age.
- Proposal of a theatrical project to teachers. The realization of theatrical projects involving pupils and teachers is widespread in schools nowadays (see for instance www.teatrogiovani.com/, the website of an Italian association promoting theatrical culture in school, which organizes a yearly school-theater national review and since 1997 has published the journal *Scèspir—Il teatro della scuola*). But less widespread is the proposal of a performing experience for teachers. The major innovation of this proposal lies in the focus on mathematics, a discipline that is rarely lived with a poetic or artistic spirit.

The project could offer opportunities for meetings with a wider audience, not restricted to teachers and pupils, in the more general perspective of favoring both the popularization and a more humanistic view of mathematics. This is to open a different perspective on those teachings commonly perceived as arid and simply fact-based, and to suggest that there are no disciplines in the realm of human knowledge that can be thought as devoid of any personal implication, be it conscious or unconscious.

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Agnes Tuska

Lesson Study:

A Student-Centered Professional Development Opportunity for Teachers

In the past, most professional development opportunities for teachers were offered in a lecture format, where an expert provided information with little or no active audience engagement. In this scenario teachers could not observe how the strategies presented in the lectures really worked in the classroom or how they affected students.

Not much was known about what was going on in the typical classroom for research analysis or for professional development purposes. One important study that was part of the Third International Mathematics and Science Study (TIMSS 1999 Video Study; see National Center for Education Statistics, 2003) videotaped and analyzed 100 typical lessons in each of the seven participating countries (Australia, Czech Republic, Hong Kong SAR, Japan, the Netherlands, Switzerland, the United States). The analysis of the lessons showed great differences in the practices and learning goals among the nations, and revealed correlations between certain national characteristics of the lessons and the mathematical achievement level of the nation's students. For example, 61% of the Japanese lessons contained instances of deductive thinking, but there were no such instances in the recorded lessons in the United States. In the United States, students worked on homework in 25% of the videotaped lessons, while there was no such instance in the videotaped Japanese lessons. The use of seatwork also showed great differences: In Japan, 41% of seatwork was spent on practicing procedures, 15% on applying concepts, and 44% on inventing/thinking. The respective percentages in the United States were 96%, 4%, and 1% (National Research Council, 1999). The Japanese students scored significantly higher than the American students on the achievement test.

These days there are several projects throughout the world with the goal of recording and analyzing classroom practices. In the United States, public release videos are promoted as part of professional development opportunities to teachers (see at www.lessonlab.com). International comparisons allow us to identify practices we want to change, discover alternative ways that may align better with our learning goals, and examine teaching in our own countries with a fresh eye by highlighting the most common practices. Some practices are so widespread in a country that teachers take them for granted and cannot even imagine other alternatives.

There is an effort in California to select the classroom itself as the place for the professional development of teachers. The name of this kind of action research is lesson study. Through lesson study, the problem of how to apply research findings in the classrooms disappears (Stigler & Hiebert, 1999). Because Japanese students are consistently among the highest achievers in most international comparison tests in mathematics, the work of Japanese teachers attracted particular interest. Lesson study was identified as an effective and widespread professional development practice in Japan, where groups of three to six teachers work collaboratively for a few months during regularly scheduled meetings. The involvement in lesson study groups and the study of the final

reports of other groups is also an integral part of the induction of the novice teachers there.

The Eisenhower National Clearinghouse has an excellent website focusing on lesson study (www.enc.org/features/focus/archive/lessonstudy). The main advantage of using lesson study as professional development is that it simultaneously develops teachers' subject matter and instructional knowledge while improving student learning. In addition, the process promotes long-term collaboration among teachers and may positively affect the teaching culture.

The lesson study process includes the following steps:

1. *Focusing the lesson:* The teachers determine a broad educational goal and choose a specific lesson topic to reach it. The choice of the topic is often specific to the learning difficulties of the particular students involved.
2. *Planning the lesson:* The teachers research the lesson topic by reading the literature about the target concept. They collaboratively develop the lesson plan.
3. *Teaching the lesson:* A teacher from the team presents the lesson in his or her classroom. The other teachers and possibly additional experts observe the lesson, taking notes on what the students and the teacher are doing and saying. The lesson is often documented through video, photographs, audiotapes, and student work.
4. *Reflecting and evaluating:* The study group meets to discuss the lesson and their observations. The teacher who presented the lesson speaks first, summarizing the flow of the lesson and the difficulties faced. The other group members contribute their own observations and suggestions.
5. *Revising the lesson:* On the basis of the suggestions, the group revises the lesson. The changes should be responsive to the students' reactions and difficulties that the observers noticed.
6. *Teaching the revised lesson:* The revised lesson may be presented to a different group of students by a teacher of the team. Often, all the teachers of the particular subject or age group in the school are invited to observe the revised lesson. Teachers from outside the school may be also invited.
7. *Reflecting and evaluating:* The teacher team, along with outside experts, participates in the second debriefing session, which may cover more general issues of learning and instruction.
8. *Sharing results:* Teachers share the lessons they develop by creating a bank of meticulously crafted lessons to draw upon for the future. The teachers may publish a report about their study, including the teachers' reflections and a summary of group discussions.

The implementation of lesson study as a professional development method requires the implementation of the lesson study culture, too. For example, interviews and videotaped sessions of the study groups revealed that many teachers in the United States who were new to the lesson study process had poor listening skills and had a hard time switching from an individual showcase of teaching skills to a collaborative group effort that focused on helping students grasp the concepts.

However, the analysis of the results of a succesful lesson study initiative in the United States (Lewis, Perry, & Hurd, 2004) showed that teachers benefited from increased knowledge of subject matter and knowledge of instruction; ability to observe students; stronger collegial networks; connection of daily practice to long-term goals, motivation, and sense of efficacy; and improved quality of available lesson plans. Lesson study not only improved individual lessons but also challenged teachers to improve their overall classroom instruction.

In a student-centered lesson study, the choice of the goals and the selection of means of delivery depend heavily on the students' background, motivation, and needs. For example, in order to strengthen collaboration among fifth-grade

students in Japan, the teacher team developed a lesson on the physics of levers. The challenge that student teams faced was how to lift an object that had a mass of 100 kilograms. The motivation came from then current news reports of a large earthquake in Turkey that destroyed several homes. Many people were trapped under the ruins. Rescue workers had to move heavy pieces of debris in order to free these people. The videotaped lesson ("Can you lift 100 kilograms?" video shown in a workshop on lesson study in California) showed students struggling with the problem in the school's gym and revealed valuable information to the observing team about the work ethics and leadership, collaborative, and communication skills of their students. Of course, 100 kilograms is too heavy for an average fifth grader to lift alone, or even in a team, without appropriate tools. That is why learning about levers became important and meaningful. Students had to explore, formulate hypotheses, and test their hypotheses about the ways levers worked in order to solve the problem. They were practicing the scientific method of knowledge building. The teacher team was satisfied with the level of engagement and collaboration among students, so the team's plan for reaching the objectives worked. The observers could also pinpoint various difficulties and misunderstandings of students that they could target by devising follow-up activities in their revision, to make the lesson much more effective.

Listening to students and analyzing their work is not an easy task. Many times the teacher is too busy with instruction to pay enough attention to record and understand the ways students respond. One of the key strengths of the lesson study process is that each observer has responsibility for providing feedback about individual students or about student groups. In addition, the recording of the lessons and the collection of student work and artifacts, including diary entries that require students to reflect on their own learning, can provide evidence for the analysis of students' progress.

The focus on student learning may improve the teacher's understanding of key concepts, too. As a personal example, let me mention a case when I was invited, as outside expert, into a lesson study group. The focus of the lesson was to introduce the concept of probability in a sixth-grade mathematics class. During a previous class period before observation, students in groups rolled dice, recorded the results, and displayed them in charts. During the observed period, each student group had to calculate some ratios, such as the ratio of the number of times they rolled a 5 to the total number of rolls they made, or the number of times they rolled an odd number to the number of times they rolled an even number. Then the same ratios were calculated using the data set of the whole class. Students were asked to argue for the likeliness or unlikeliness of certain ratios. Many students were able to give reasonable explanations.

At this point, the teacher introduced a new question: "What do you think, what should be the ratio in an ideal world?" She continued talking about imperfections, possible mistakes in our everyday world, in order to contrast it with the "ideal world." She hoped to get ratios such as the number of 5s to the total number of rolls is 1 to 6 or the number of odds versus evens is 1 to 1, from the students. The use of the "ideal world" expression confused many students. They started to talk about fairness or possibilities of making errors, and many of them felt guilty of doing something wrong for getting a ratio that was far from the "ideal." This confusion was reflected in their written summary statements about what they learned that day. Yet some students gave very clear explanations, using such words as "expectations" and "most likely."

During the discussion of the lesson, the instructing teacher initially did not realize that something had gone wrong. Her concept of theoretical probability was a mix of "wishful thinking" and "well-controlled environment" for doing the experiments. Only when others were quoting and interpreting the writings of her students did she realize that there can be large differences between theoretical and experimental probabilities without "doing anything wrong," and find the real meaning of probabilistic statements. She did not understand earlier that we say that the probability of getting an odd number is the same as getting an even just because there is no reason to assume

anything else on a fair die, yet rolling a die 10 or 20 or 50 times may provide ratios far from the1 to 1 ratio. However, it would be quite unlikely that the ratio would be very far from 1 to 1 when we roll many times. The lesson study process helped her learn and improve her understanding of a key mathematical concept that she had taught for years.

At the time I wrote this article, I worked with a group of Algebra 1 teachers on a lesson study grant. The Central Valley Mathematics and Science Partnership (CVMSP) is a US$1 million grant in California that is designed to strengthen student achievement. The mathematics component of the project was intended to improve teacher quality in grade 5 Algebra 1 instruction. It provided intensive professional development during the summer of 2004 and developed a community of teachers through content mentoring and coaching of district mathematics teachers by university faculty using the Japanese Lesson Study model during the 2004–2005 academic year.

The participating teachers volunteered for the project from selected partner schools of a large school district. The school administrators supported the grant and encouraged their teachers to participate. The teachers were put into lesson study groups. Each teacher received an hourly stipend for time spent on the project. Participants attended a two-day workshop on lesson study by an outside expert in August 2004. The workshop was followed by a one-week (40 hours) intensive content enhancement workshop, with the team instructed by mathematics faculty from local universities before school started. For the content enhancement workshop, teachers were divided into two groups by grade levels. I taught the group of Algebra 1 teachers. Algebra 1 is the typical mathematics course taken by students in grades 8 or 9; therefore the group included about 10 middle school teachers and 10 high school teachers forming three lesson study teams. Each team included teachers of a particular high school along with teachers from the feeding middle schools.

The lesson study teams had time during the two-day workshop to draft their lesson study objectives. During the content enhancement, they had time to connect their objectives with a particular curricular focus and to discuss possible key activities for the lesson.

The teams had six scheduled 90-minute afternoon meetings, one every two weeks during the fall semester, to further refine the particular lesson and to draft a detailed description of it. This included planned instructional segments, teacher notes, and questions to be used by teachers along with expected student responses, assessment tools, and a list of needed materials. A whole day was spent on the original teaching, observation, reflection, and revision of the lesson, and another whole day on teaching, observing, and reflecting on the revised lesson, along with the final write-up of the lesson for sharing. The school district provided substitute teachers for these two days.

The teachers filled out a reflection sheet at the end of each meeting day. Most of the teachers found this experience very useful and rewarding. They felt empowered. Some teachers commented that this experience gave a sense of community, provided good understanding of articulation issues, and renewed the pleasure of teaching for some teachers who had been feeling burned out. There was no chance to measure differences or improvements in student learning, but the teachers hoped to get good results because many of their students had already commented on the teachers' enthusiasm and more engaging lessons.

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Paradigm Shift:
Teachers Scaffolding Student Comprehension Interactions

Early studies of classroom practices note the lack of time and commitment to teaching comprehension strategies in the United States (Durkin, 1978). Despite a quarter of a century of research on comprehension, researchers continue to document little comprehension instruction in classrooms (Pressley, Wharton-McDonald, Mistretla-Hampton, & Echevarria, 1998a). In fact, recent research (Dole, 2000; Pressley, 2000) suggests that teachers are not aware of the steps necessary to ensure rigorous, strategic reading in classrooms.

In the United States the National Reading Panel in its RAND Report (2002) suggested a vision for proficient readers who are capable of (a) acquiring new knowledge and understanding new concepts, (b) applying textual information appropriately, and (c) being engaged in the reading process and reflecting on what is being read. The RAND Reading Study Group (RRSG) defined reading comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement. This process consists of three elements: (a) the reader who brings his/her cognitive capabilities, motivation, and knowledge; (b) the text which consists of the surface code as well as mental models; and (c) the activity of decoding higher levels of text by processing and self-monitoring for comprehension. The National Reading Panel challenged educators to rethink comprehension instruction and recognized and confirmed the complexity of comprehension processes (RAND, 2002).

El-Dinary, Pressley, and Schuder (1992) argued that strategy instruction was too far removed from teachers' classroom practices and beliefs about comprehension instruction and therefore had no impact on classroom instruction. Pressley et al. (1998a) suggested that without a paradigm shift in teacher thinking about reading and comprehension, classroom teachers would remain unable to change their classroom practice. Thomas Kuhn (1962) defined a *paradigm shift* as a revolution where one conceptual world view is replaced by another. Teachers have to change from one way of thinking to a different way of thinking and organizing their teaching.

Informed by the failure of past research to provide consistent evidence that teachers have made a paradigm shift (Pressley et al., 1998a) in explicitly teaching multiple comprehension strategies, we describe the first-year results of a three-year longitudinal study in an inter-district elementary magnet school. The current study documents two district magnet school teachers' paradigm shifts in attempting to develop metacognitive awareness in first and fourth graders. Through direct, explicit instruction these two teachers worked to increase student knowledge and conscious awareness of what, how, where, and when to apply strategies in order to regulate comprehension. This is a preliminary research report that examines the research on comprehension instruction and how one first-grade teacher and one fourth-grade teacher applied their knowledge of reading theory and multiple comprehension strategy instruction to make a paradigm shift within their classrooms. This research is focused on two research questions:

1. Can teachers make a paradigm shift in comprehension instruction?
2. Does direct, explicit, and extensive multiple strategy comprehension instruction improve comprehension outcomes for these students?

Comprehension Instruction

Early research on comprehension identified individual strategies that would increase students' comprehension. Numerous researchers demonstrated that individual instructional strategies resulted in increased comprehension. Among these stratagies were developing vocabulary (Pearson & Johnson, 1978; Beck, Perfetti, & McKeown, 1982); developing visualization (Pressley, 1976); retelling and resynthesizing (Brown & Day, 1983); asking questions before, during, and after reading (Pearson, et al, 1992); asking questions of oneself, the authors, and the text (Andre & Anderson, 1979); and determining the most important ideas (Baumann, 1984). This body of research identified a long list of isolated instructional strategies that proved to be effective in improving comprehension. The limitation of these studies was that they focused on teaching a single strategy as an end in itself. Recent literature, however, shows that learners need to understand how to orchestrate, coordinate, and apply multiple strategies in order to improve comprehension (Brown, Pressley, Van Meter, & Schuder 1996; Dole, J.A. 2000; Pressley, El-Dinary, Wharton-McDonald, & Brown, 1998b).

The important role of metacognition in comprehension monitoring is also firmly established in theories of reading (Harvey, & Goudvis, 2000; Keene & Zimmerman, 1997; McCarthey, Hoffman & Galda, 1999). Metacognition is thinking about thinking, knowing "what we know" and "what we don't know." Thus, it entails both the conscious awareness and the conscious control of one's learning. This literacy research deeply influenced current classroom practices and emphasized the important role metacognition plays in learning and comprehension.

For many researchers, Vygotsky's (1978) socio-cultural theory of mediated learning has greatly influenced the recent instructional practice research. Several researchers designed guided practice models where teachers "scaffolded" student learning (Fielding & Pearson, 1994; Brown et al., 1996; Courtney & Abodeeb, 2001; McLaughlin & Allen, 2002). In these models teachers sensitively assisted students and gradually transferred responsibility from the teacher to the student (scaffolding).

These researchers provided readers with effective instructional approaches to understand texts rather than merely testing students to check on their comprehension. All of these researchers focused on supporting students through a metacognitive transaction that enabled the students to eventually take responsibility for their own learning. This article details how two teachers developed negotiated metacognitive events that led and nudged students to use multiple comprehension strategies.

The school

The first and fourth grade classrooms used for this research are a part of a local elementary school. This school draws students from seven municipal school systems. Fifty percent of the children coming to this school are from a large urban setting, with the remaining children coming from six suburban towns. There are three classrooms for each grade (P–5) containing approximately 20 children per classroom. The children attend school for an extended day and school year. The school was opened four years ago and its philosophy is guided by Howard Gardner's educational theory of multiple intelligences. Twenty-two percent of the students qualify for special education. The school's population is extremely diverse, both racially and in terms of socioeconomic status (SES). In fact, this school is more diverse than most other elementary schools in this northeast state.

The teachers

The first-grade teacher had been teaching for 11 years and was reading-certified. She had read two texts (Keene & Zimmerman, 1997; Miller, 2002) over the summer to prepare her to teach comprehension to first graders in a more conscious, consistent manner. She stated, "For years I was just focused on teaching first graders to read. Through my professional development I am coming to realize that children should be learning

to read and reading to learn at the same time. There shouldn't be a difference. I have been in a classroom for 11 years and I am just trying to understand this fact." She explained that she intended to apply this thinking throughout the year.

The fourth-grade teacher had been a middle-school science teacher for five years before coming to this particular school. He stated, "I am determined to help these students be better readers. They made significant gains on their reading assessments last year but they need to keep gaining. They came in as a very weak class in fourth grade. I am determined to support them in their reading gains." He had read the same two books that the first-grade teacher had read over the summer. He stated, "In the past I did a lot of assigning. I told students to read books and answer questions. I am beginning to realize that I need to do more to help these children become better comprehenders of texts." He too was intent on improving his craft as a teacher in directly teaching comprehension to students.

Both teachers discussed reading comprehension strategies with the whole class and then used small, guided reading groups for instruction.

The classrooms

The classrooms are new, light and spacious. Each teacher has his/her own office adjacent to the classroom. Classroom rules are posted on the walls: Respect each other and care about each other, be kind, be a good friend, etc. Each classroom has a smart board wired with the latest technology. The teachers also work from laptops. In both classrooms there are six laptops available for students. Several large tables and chairs are organized for student work areas. There are large meeting spaces under the smart board in each room as well as in other areas of the classrooms.

The introduction of schema

Schema theory (Anderson & Pearson, 1984) is a theory about how knowledge is organized and stored in the brain and used to make sense of our experiences and interactions (Moore, 1995; Rumelhart, 1981). Schunk (2000) defined a schema as a structure that organizes large amounts of information into a meaningful system, while Ormrod (1995) defined it as a mental unit that represents a class of similar actions or thoughts. The knowledge within schemata is organized in a hierarchical fashion. Successful readers activate their schemata or relevant prior knowledge and use these before, during, and after reading to construct new knowledge and incorporate this new knowledge into their existing schemata or develop new schemata.

A first-grade learning episode

The first-grade teacher introduced numerous comprehension strategies including visualizing, establishing prior knowledge, calling up schemata, questioning, and determining importance. In the following learning episode the first-grade teacher introduces the concept of schema. Also evident in this episode are other comprehension strategies, such as establishing prior knowledge. In this episode the teacher is reviewing a schema which had been introduced once before when she read Cynthia Rylant's *The Relatives Came* to the entire class.

Teacher: *The Relatives Came. I told you some of my personal connections about what this made me think of. So, we've done lots of reading and lots of stories that have helped us to connect and make personal connections. And Halley and Ben said some smart things. They said a personal connection is something that reminds us of something special. And it helps you connect your life to a book and it helps you understand the story more when you do that. Right? Well today, we're going to make some personal connections with another story, but this time, do you remember when I wrote all of your personal connections down?*

Class: *Yes.*

Teacher: *I'm not going to have you share your personal connections and I'm not going to write them down. This time, you're going to keep your personal connections in…*

Ben: *Your brain.*

Teacher: *Your brain. Very good, Ben. You're going to keep your personal connections in your brain. And you're going to share your personal connections with your buddy today after the story is done. You're going to hang on to some personal connections you're having in your brain. And do*

you know what good readers do? Good readers think about personal connections the entire time they're reading. So I hope that while I read this story, your brains will be making some special connections to your life…something that this might help remind you of. Wayne, do you have a question?

Wayne: *I know what we did.*
Teacher: *What did we do?*
Wayne: *We did some schema.*
Teacher: *Yeah, we did schema.*
Wayne: *We talked to each other and then we said something about what you think you know about the book.*
Teacher: *Yeah, we sure did.*
Wayne: *That's all I know.*
Teacher: *Well, you know a lot because we did do something about schema. Who knows what schema is? That's a pretty fancy word. What is schema? Devin, what is it?*
Devin: *Things in your brain.*
Teacher: *Okay, so it's things in your brain that you remember. What else is it? How would you describe schema? Em?*
Emily: *Everything in your brain from your whole life.*
Teacher: *That's right. Everything in your brain from the moment you were born, to this moment right now is everything in your brain. That's your schema. Does everyone have the same schema?*
Class: *No.*
Teacher: *You're right, Nick, you have a different schema than Hannah does. Do you have the same schema as Kesha?*
Class: *No.*
Teacher: *No, because you're not the same people and we all haven't done the same things. Some of you have a schema of visiting a place that some of us have never visited. Some of you have a schema about having a baby brother that was just born and some of us don't know what that feels like. So, we're all very different, which makes our schema very different. Well, the story I'm going to read to you today, and this is where I want you to keep your personal connections in your brain, because you're going to share them later. You're actually going to draw your personal connections. I want you to keep them in your head. The story is called* Ira Sleeps Over *and the author is a person called Bernard Weber. So, listen very carefully to the story, and I hope that I am going to see those brains thinking of some connections because I bet you'll have a lot.* (She reads)

The teacher read *Ira Sleeps Over* by Bernard Weber. The teacher stopped initially and modeled speaking her thoughts and connections aloud to make them visible for the students. Additionally she paused several more times for students to share the connections they made to the story. At the conclusion of the story children were assigned to groups of six. Each member of the group first discussed what their connections were to the story.

Hannah: *I have a special blanket I sleep with every night. When a friend comes over I hide it under my bed.*
Harry: *Why?*
Hannah: *Because they might think I'm a baby or something. Just like Ira.*
Taylor: *They wouldn't think you were a baby if they were friends.*
Rachel: *I went to my grandma's house to sleep over. I need a night light because I have trouble sleeping without one. I am scared of the dark.*
Hannah: *Me too.*

Thoughts continued to center on favorite items that students had a need for, like Ira's Teddy in the story. Students were then paired with buddies and instructed to draw their connections on a large piece of paper. Each individual drew on one half of the paper. Each drawing pair reconstituted themselves with another group. The first graders shared the connections they made to the text through discussion of their own personal illustrations.

Finally the class came together to further discuss schemata and making connections to text.

Teacher: *How do all these connections help you understand the book?*
Children: *It's schema.*
Teacher: *What does that mean?*
Rachael: *A schema for sleeping with my night light and I can sleep with it when I have a sleepover.*
Teacher: *How did that help you understand the story?*
Rachael: *I connected to the story. Just like Ira, I don't want someone to think I'm a baby when I sleep over.*
Teacher: *So a schema is something that connects a story to your life and helps you to understand the story better. Right?*

The classroom teacher gently attempted to push these first graders to consciously make connections to the text so that they better comprehended the text itself. Through collaborative talk the teacher specifically questioned the students on exactly what they thought a schema was and further questioned how it helped them comprehend texts. She asked students to articulate this understanding and clarified any confusion. The teacher attempted to make these readers hyperaware of how they explicitly used their schemata to comprehend texts

A fourth-grade learning episode

Like the first-grade teacher, the fourth-grade teacher also emphasized multiple comprehension strategies. The fourth-grade teacher began a discussion on how the rereading of a particular book made the students see and understand some things differently. This episode based on students' prior knowledge evolved into a discussion of the schema as a comprehension strategy. The students had originally complained about reading a book that some of them had already read in third grade. The teacher questioned the students.

Teacher: *Do you think it (the book) meant the same thing to you last year as it did to you when you read it this year?*
Child 1: *No, not to me.* [This was followed by several other responses.]
Teacher: *What do you think made it different?*
Child 2: *Because we didn't understand it when we were younger.*
Child 1: *We are more skillful. We make more connections.*
Teacher: *Good. What could be different in making connections to a book when you read it more than once?*
Kaisha: *They probably didn't understand it because they didn't have a response journal to write stuff down.*
Teacher: *So the response journal helped us to clarify things and to look at things.*

The teacher continued to push the thinking of these fourth graders. He wanted them to understand the deeper connections they had made to the text through an expanded schema and rereading of the text. Since the students had not grasped this concept, the teacher questioned them again in a different way.

Teacher: *My question before and I didn't really get it answered: What's different about you now that would help you to make connections and do things more than last year? What have you done since last year?*
Child 3: *More work.*
Child 1: *These things.*
Child 4: *Changed our behavior.*

The teacher realized that "more work," and "these things" were generic answers from children who may not have truly understood the concept of making deeper connections with expanded schemata. He further probed by making concrete suggestions that led student thinking. The teacher guided the students' conscious awareness to where he wanted their thinking and understanding to go.

Teacher: *What else have you done? Have you seen any more movies?*
Class: *Yes.*
Teacher: *Have you read any more books?*
Class: *Yes.*
Teacher: *Have you seen any more television shows?*
Class: *Yes.*
Teacher: *Have you met any more people?*
Class: *Yes.*
Teacher: *You have met me since last year… Have you learned any new things?*
Class: *Yes.*
Teacher: *Have you seen any new internet sites?*
Children: *Yes.*
Teacher: *Have you written any more reports or done anything?*
Children: *Yes.*
Teacher: *So all of those things you've done make you different when you go to make connections (to a text). Or when you go to think about a book. All of you, the big word for that is "schema"* (writes on board). *Say that word.*
Children: *Schema.*
Teacher: *Your schema is kind of what makes up what you know and you know a lot of different things than you knew the last time you read it (this book), those of you who read this before. Those of you that didn't read it, I heard some great connections being made to things that you have seen or read before.*

This teacher tried to bring to the students' conscious awareness how they were more knowledgeable from year to year. He questioned them about different experiences they might have had that had contributed to the building of their schemata. In fact, the teacher actually suggested to the students a variety of experiences they could have had that expanded their schemata.

The process

Both of these teachers made a paradigm shift and did so by setting aside specific time several days a week to discuss and model comprehension strategies. They deliberately and consciously spoke about specific comprehension strategies. Each teacher used and taught the specific language of comprehension and worked intensely with large and small groups. The teachers had learned to explicitly describe their thinking aloud to groups of children so that the children would see and hear what the teacher was thinking and doing as he or she applied a particular strategy. The teachers would "talk aloud" what strategy they were thinking about, how they were applying it and why they thought it was the best strategy to apply. It was important for the children to see how strategy use looked, felt, and sounded. Schema strategy instruction was a focus in both the first- and fourth-grade classrooms at the end of winter. Neither teacher was aware of what the other teacher was focusing on. The teachers understood the importance of establishing a community of learners/risk takers who were immersed in a culture of metacognitive awareness. The first-grade teacher tried to make her students consciously aware of the need to activate their prior knowledge before, during, and after reading and to use this schema to relate the text to their own lives. The fourth-grade teacher tried to make his students realize that they were better at understanding texts because they had added to their own schemata and made better connections to the text. The teacher pointed out that the students used their expanded schemata to enhance their understanding of the text. Both teachers modeled and discussed strategy instruction and expected their students to apply comprehension strategies independently later as they interacted with all types of texts.

Through exploring different teaching practices and observing how children were more successful with specific strategy instruction the following process emerged from the research.

- Teacher explanation of the strategy using precise and exact language.
- Teacher modeling: demonstrating what the strategy application would look and sound like.
- Teacher making her/his thinking visible.
- Guided practice: practice and discussion with the whole group—collaborative talk.
- Practicing the strategy with a buddy, small group, or independently.
- Scaffolding by the teacher: raising individual strategy use to conscious awareness through engaging, questioning, prompting, modeling, explaining, telling, challenging, reflecting, clarifying, and leading.
- Bringing the group together to discuss any bumps and how the strategy worked in order to further reinforce the strategy use—further raising strategy use to conscious awareness.
- Teacher constantly provides for independent practice and creates an atmosphere of self-reflection and self-regulation.

As can be seen in the learning episodes, the intent of the teachers' instruction was to make each individual student *hyperaware* of what strategy they needed to select and apply in order to construct meaning of texts. The teachers scaffolded and guided learners until these young readers became consciously aware of comprehension strategies to apply as they constructed meaning in texts. Through this type of thoughtful literacy teaching, students were more actively and cognitively engaged in the reading process, and were more metacognitively aware.

Research results

Students in each of these classrooms demonstrated progress in their comprehension strategies as shown on several assessment instruments including

standardized assessments (Degrees of Reading Power – DRP), individual reading interviews, and individualized reading inventories such as the Developmental Reading Assessment (DRA) (Beaver, 1997). Both teachers also reported significant improvement in students' overall classroom work, level of participation, engagement in discussion groups about texts, and general self esteem.

Table 1 shows fall assessment data and winter assessment data for the DRA assessment results from the first-grade classroom. Almost all of the first graders, 17 of 20, demonstrated considerable growth on their DRA scores. Wayne is a visually impaired child who repeated first grade and his pre- and post-assessments remained the same.

Table 2 shows fall assessment data and spring assessment data for the DRP for the fourth graders. The fourth graders performed significantly better on the spring DRP measure than the fall DRP. Almost all of the fourth graders, 17 of 18, made significant progress on their DRP scores. Only one child, a Low English Proficient student, did not gain in her spring score. The fall and spring DRP scores were analyzed to determine if there were any significant changes from fall to spring. On the average there was a 12-point gain in DRP scores (fall mean score = 44.28, spring mean score = 56.39). The median gain overall was 13.5 points. A t-test was conducted comparing the two DRA scores and the results were found to be significant, $p > .01$ ($p = .005$). Some of the most significant growth was seen in struggling readers: Shane, Sebastian, Charlene, Kahari, and Jade.

Both teachers reported that students learned that reading was a meaning-making process. The first-grade teacher reported that she saw growth in the rate of student self-corrections of oral miscues that interfered with constructing meaning. Both teachers reported that students seemed to be more metacognitively aware and engaged during the reading process. Each teacher stated that they observed significantly more children using multiple strategies to repair their reading when something did not make sense during reading.

Table 1 DRA Scores for First Grade

Name	Fall DRA 02	Winter DRA 03	Winter accuracy
Abigail	4	14	99%
Ashaya	10	14	98%
Ben	6	14	98%
Charlene	3	8	96%
Chris	2	4	96%
Rachel	24	28	98%
Demetrius	6	10	96%
Devin	10	14	98%
Emily B	24	24	98
Halley	10	16	96%
Hannah C	24	28	99%
Harry	24	24	100%
Jordan	3	4	96%
Joseph	1	6	96%
Kelly	3	6	96%
Kesha	3	8	96%
Nicholas	8	14	99%
Taylor	3	6	96%
Wayne	1	1	94%
Zhanel	4	8	97%

Table 2 DRP Scores for Fourth Grade

Name	Fall DRP: (p = .70)	Spring DRP: (p = .70)	+/–
Alexander	69	79	10
Alexandria	47	56	9
Amanda	61	65	4
Bridget	69	83	14
Carter	50	65	15
Charlene	30	43	13
Christian	59	74	15
Gabrielle	35	52	17
Jade	30	44	14
Joven	46	60	14
Kahari	16	42	26
Lashanda	35	40	5
Mary	39	49	10
Naamah	54	52	-2
Sebastian	34	55	21
Shane	31	47	16
Shanell	43	51	8
Tenell	49	58	9

Discussion

The goal for these children was to understand how to orchestrate and coordinate a number of different strategies as they constructed meaning. Strategy instruction for all learners can be challenging and confusing. Strategy instruction took a great deal of time and effort for these teachers and also for these children as they learn to read and comprehend. If teachers can help these learners be successful and independent life long readers, who use multiple comprehension strategies flexibly and automatically, then their time and struggle will be well worth it.

This research suggests that students are capable of becoming strategic when teaching is geared to their developmental level. Appropriate reading strategies need to be thoroughly and thoughtfully explained and modeled. The two teachers had significantly changed the way they taught comprehension. In this research both teachers created structured routines for modeling and explicitly explaining strategy use, while also questioning readers in a constant attempt to make the invisible visible. The teachers constantly provided specific feedback using detailed and specific language with each reader. Both teachers reported that their continual scaffolding of children made the difference in whether the children actually learned and applied a strategy. The first-grade teacher stated, "I learned to question the children by asking them what I would hear them saying and what I would see them doing as they used the strategy. I would always question, 'What does it sound like? What does it look like?'" For example, when the first-grade teacher had taught a strategy of rerunning text when reading didn't make sense, she had the children practice in pairs. She bent down close to Joseph and his partner Kesha and asked, "What does it sound like? What does it look like?" Joseph demonstrated rerunning by moving his finger in a backwards sweep. Kesha said, "I go back to the beginning of the sentence and reread (demonstrating return sweep with her finger) by repeating the words and seeing what went wrong." The teacher questioned, "Kesha, what do you mean when you say, 'What went wrong?'" Kesha answered, "Oh, I see what the bump was, I have to reread to make sense. I have to figure out what didn't make sense." The teacher confirmed for Joseph and Kesha, "Yes, when we reread we are figuring out what went wrong by going back (modeling with finger) and reading exactly what we had just read so that we can make sense." When the class returned to the meeting area the teacher explained just what Joseph and Kesha thought, showed, and said. The teacher scaffolded through a mindful negotiated process where she first observed the readers and then questioned, provided feedback, modeled and directed as necessary, and repeated and rephrased the words of the readers to provide confirmation, praise, and encouragement. The scaffolding changed as the readers changed. The teacher's role is to provide just the right amount of support.

This research suggests that teachers need to use precise and exact language in their strategy modeling in order to enable readers to absorb this language, understand its intent, and eventually use it independently. The teachers in this research expected readers to practice and internalize strategies, and therefore the readers appeared to make multiple strategies a part of their reading routine. In each classroom the teachers created an atmosphere of self-reflection and self-regulation: What strategy should I apply? How will it help me understand what I am reading? Why should I apply it? In this research the teacher modeled, collaboratively talked with the children, assisted, and interacted while scaffolding and redirecting their strategy use. The teacher's scaffolding changed as the reader changed. The teacher continued guiding student practice until the students demonstrated that they had internalized the comprehension strategies through discussions, running records, oral miscue corrections, and interviews. The first-grade teacher stated, "Not only did I realize how specifically and detailed I needed to teach comprehension strategies but more important I came to realize how right down next to each child my scaffolding needed to become so that I nudged and pushed each reader further. Sometimes I was just ahead of what the child needed, tugging him along; sometimes I was right behind and gently pushing; and sometimes I was right with the child." Although the comprehension strategies used in these classrooms

were initially introduced and taught one by one, teachers eventually discussed and demonstrated multiple and flexible strategy use. The intent was that students would learn to orchestrate multiple strategies flexibly and appropriately.

Conclusion

As researchers, we agree that when readers are given cognitive strategy instruction, they make significant gains on measures of reading comprehension over students trained in conventional methods (RAND, 2002). Research has found that teaching a variety of reading comprehension strategies in natural settings led to increased memory, understanding new passages, and, in some cases, general improvements in comprehension. This is a goal we strive for as researchers, and we agree that as highly professional teachers explicitly teach multiple strategy instruction, even poorly, their students will most likely improve in reading comprehension (Duffy, 1993; Pressley, Johnson, Symons, McGoldrick, & Kurita, 1989).

Metacognitive awareness, motivation, responsibility, social interaction, and direct and explicit instruction are all important factors in developing comprehension. Readers need to be guided and supported as they learn to use strategies flexibly, efficiently, and automatically.

We are encouraged by these results but recognize the preliminary nature of our findings. This is a longitudinal research project and it is only at the conclusion of its first year. For this reason, we do not believe that the data we have collected thus far are generalizable outside the classrooms that we have observed. However, initial comparison test data indicate that there are positive effects in making first and fourth graders metacognitively aware of multiple comprehension strategies. Research clearly shows that readers who explicitly receive strategy instruction are more strategic. This research on younger readers suggests that strategies can be directly taught and that doing so seems to benefit beginning readers as well as more experienced readers. We must continue to build on this research to provide best comprehension instruction for all students. Learning to become a successful reader who uses multiple comprehension strategies flexibly and automatically is a complex and long-term process.

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Serghei Lisenco

Involving Students in Tracking Discussions:

Learning Through Evaluation

The more widespread interactive teaching methods are, the more frequently we hear the question: How do we evaluate the "products" of these approaches? Teachers feel that such traditional methods of evaluation as exams, oral and written tests, etc., do not always reflect students' success completely and adequately as they are primarily designed to easily check the presence of concrete knowledge (according to the principle that the answer is either "correct" or "incorrect"). It is much more rarely that they help us evaluate the level of cognitive skills—analysis, synthesis, and argumentation. Moreover, by means of these methods it is practically impossible to evaluate many skills that are vitally important to communication and understanding.

Therefore, intuitively or consciously, many teachers try to apply new methods of evaluation that offer more opportunities than the traditional ones. However, teachers still worry whether these alternative approaches to evaluation will turn out to be sufficiently objective and authentic. We should certainly welcome any effort to achieve objectivity of evaluation and thus improve the teaching/learning process. I believe, however, that the key change required to really transfer this process onto a qualitatively new level is not the employment of new tools and evaluation procedures, but a change in the entire system of teacher-student relations. Without such change, which is based on mutual responsibility and trust, new procedures and tools will remain ineffective.

In this paper I am going to present a strategy for evaluating formal discussions that can prove useful when we want to evaluate the knowledge and skills of the students that become evident while discussing a specific topic. Before I start, however, I need to explain that the experience described here is the product of a "transition" period in our education. The system to which we were accustomed put a teacher into the key position—he/she was the one to determine the goals and methods of teaching, to establish evaluation criteria, and to make a final verdict of the level reached by a student. Now we are gradually moving to a different system in which teacher and student are equally responsible for the result and consequently take an equal part in goal setting and in monitoring the implementation of these goals. The author hopes that the ideas offered here will prove useful primarily to those teachers who use interactive methods and thus are engaged in changing the present system by encouraging new procedures and norms.

Discussion creates that authentic life context in which, according to the theory of constructivism, knowledge comes in contact with reality and becomes the genuine "property" of its participants.

Discussion has a number of characteristic features that supplement the purely verbal information, and thus allow the observer ("evaluator") to make much deeper conclusions about the level of knowledge and the participants' skills in using this knowledge. Observing the performance of participants, listening attentively to their arguments, we perceive not only what is said, but also *how* it is said: intonation, tempo, mimicry, gestures, and other paraverbal and nonverbal messages. These messages become a sort of "seasoning," allowing us to evaluate the real "taste" of the speeches delivered by the participants.

These properties of discussion make it very attractive to many teachers. To be honest, at times the same properties make this kind of evaluation much more subjective as compared with other evaluation methods (such as written work).

Thus, a creative teacher faces the problem of designing an evaluation process so that it keeps all the positive features of discussion as an evaluation tool and, at the same time, creates conditions for making this tool as objective as possible.

A teacher or faculty member who intends to use discussion as an evaluation tool needs, first of all, to follow certain main principles while preparing the procedure: to define the goals clearly, to formulate them using specific terms that determine the conditions of performance, and to describe the final "product" developed as a result of performing the task. While planning the use of discussion as an evaluation tool start by asking yourself:

- What knowledge should students demonstrate?
- In what form should they demonstrate this knowledge?
- How many speakers can be granted time to express their opinions?
- What skills should participants demonstrate?
- How much time will each participant have at his or her disposal for stating an opinion and for refuting opponents' opinions?
- How many times can one participant express his or her opinion during the discussion?
- How can we provide equal opportunities for all participants to state their ideas?

Answers to these questions will allow you to see/hear/feel how the discussion will likely develop in reality. If your vision is still not clear enough, continue to ask yourself questions until the desired nature of the "final product" becomes concrete and adequately meets the goals you have set.

When planning a discussion in the 10th grade of high school about the role revolutions play in the development of human society, I set the following goals for myself as teacher:

1. To evaluate how well students know historical facts connected with revolutionary events in Europe and America in the 17th–18th centuries;
2. To evaluate students' level of critical thinking (ability to trace cause–effect connections, to choose an opinion based on a system of values, to assert their opinions and to respond to arguments of opponents);
3. To evaluate students' skills in presenting their knowledge and opinions before an audience.

At the same time I wanted the class to be as interesting for my students as possible and the situation in which they demonstrated their knowledge to be quite informal. A discussion format met these requirements perfectly, but its being so interactive and emotional bore a potential risk for the evaluation process, as it could turn out to be very complicated and subjective.

Barbara Miller's work (Miller, 2002) and my long-term experience training students for formal debate helped me overcome these challenges.

I chose Rubrics as a basic tool, allowing for the evaluation of both the knowledge and skills shown during a discussion.

This is a perfect tool. Not only does it allow a teacher to evaluate students' work and to define the level of their academic achievements, but it also provides the same opportunities to students themselves. Rubrics give them information on what their academic achievements are and what needs to be done to lead these achievements to perfection. A typical rubric consists of three basic elements:

- Specified areas of academic performance (evaluation criteria).
- A scale of levels of academic achievements (expressed by definitions or grades).
- The description of each level of achievement (standards).

Evaluation criteria	Levels of academic achievement				
	Poor	Satisfactory	Good	Very good	Perfect
Criterion 1	*Standard*	*Standard*	*Standard*	*Standard*	*Standard*
Criterion 2	*Standard*	*Standard*	*Standard*	*Standard*	*Standard*
Criterion 3	*Standard*	*Standard*	*Standard*	*Standard*	*Standard*

Creation of a rubric begins with defining the criteria according to which students' performance will be evaluated. Barbara Miller advises applying from two to four criteria *(2002, p. 41-42).* She claims that too many evaluative criteria make students less attentive and thus lead to lower quality performance.

After you have set the criteria, check their importance and usefulness by answering the following questions:

- Is there a chance that a student will perform the task meeting the criteria, but will not achieve the goal of the task?
- Is there a chance that a student will achieve the goal of the task without meeting the criteria?

If you answer these questions positively, the criteria need to be reconsidered.

The next step for designing a rubric is to define differing levels of academic achievement. It is challenging to name an exact number of levels. An ideal rubric will be the one which describes a sufficient number of levels so that the student can use them for further academic development. At the same time there should not be too many levels, otherwise they won't be readily differentiated and may jeopardize diligent performance of the task. The experience of various teachers shows that it is enough to describe 4-5 levels of achievement. Some teachers believe it is useful to describe the lowest level as *absence of aspiration* and the top level as *ideal performance.*

After criteria and levels of educational achievement have been set, start filling out the cells of a rubric, describing the desirable result. Use terms or characteristics which are easily observable. Describe what you expect, and not what is absent, i.e., avoid negation. For example, it is better to use the wording *the student uses only one source* instead of *the student does not use various sources.*

In describing different levels, avoid using value-laden adjectives or adverbs. For example, it is better to write *the student mentions various facts to support his opinion*, instead of *the student shows good knowledge of factual material.* The rubric should help a student to understand what he or she needs to do to achieve the desired progress; therefore instead of using normative terms, such as *good, bad, medium*, etc., describe observable attributes of these terms. It will be much more useful for a student to read that *stated ideas have no logical connection and it is hard for a listener to understand how the stated facts support the arguments* than *the performance lacks logical organization.*

For my history class I designed a rubric which supported evaluation on the basis of three criteria (each of which corresponded to one of the set objectives) and five levels of academic achievement.

Once a rubric is ready, it should be discussed with students. This conversation is necessary so that students realize what is expected from them and may prepare accordingly. Besides, this talk allows for the collaborative editing of the rubric so that its meaning is understood by everyone in the same way.

While the students were getting acquainted with the rubric they wondered about the meaning of two phrases: *formulates the value underlying an opinion* and *uses original ways for drawing attention*. We discussed possible meanings of these phrases and found examples that helped students understand what was expected from them. Let's say that *human life* can be used as a value, and in this case all facts and arguments should show either strengthening of this value (e.g., opportunities for free development) or, on the contrary, ignoring this value (e.g., the killing of tens of thousands of people in the epoch of Jacobean dictatorship). Students proposed other values which can serve as a basis of a chosen opinion: *economic well-being of a society, a principle of equality and freedom, independence of a nation.*

Original ways of attracting attention and stressing important ideas were also illustrated through examples: using clear graphic schemes and figurative analogies; and beginning the talk with a vivid statement that may not be obviously connected with the topic of discussion, but the speaker shows this connection during his or her talk.

The next stage in preparing for a discussion is talking about its formal rules.

It was decided that the class would be divided into two groups: The students belonging to the first group (we shall call them *speakers*) will actively participate in the discussion, while all the others will be given

Criteria	Levels of educational achievement				
	Poor	**Satisfactory**	**Good**	**Very good**	**Perfect**
Knowledge of the theme	Names no more than two facts. Makes mistakes in chronology. Confuses events happening in different countries. Does not use scholarly concepts.	Uses facts from the history of two countries. Correctly uses the basic concepts of the theme. Makes discrepancies in chronology.	Uses facts from the history of England, France, and the USA taken from the textbook. Correctly applies scholarly terms.	Uses facts from the history of England, France, the USA taken from at least two sources.	Uses facts from the history of England, France, and the USA, using three or more sources.
Critical thinking	Position is not clear. Is not able to show connection between facts and the discussed position.	Formulates and presents no more than two arguments in support of a position. Uses elementary conclusions while proving the point. The facts from the history of different countries are not classified and are used at random.	Formulates a position and supports it by at least three arguments based on examples of historic facts. Formulates the value underlying his/her position. Formulates questions for getting more specific information.	Formulates a position and supports it by at least three arguments; while proving a point uses facts, analogies, references to expert opinions. Explains each argument basing points on the chosen value. Compares his/her arguments to the arguments of opponents and develops an idea of their persuasiveness. Poses questions to opponents and uses their answers to support own position.	Formulates a position and supports it by using a value criterion. Uses various types of arguments (more than three); reveals their strengths and weaknesses. Interprets proofs provided by opponents to his/her own advantage. Anticipates possible objections and responds to them. Explains the connection of the discussed theme with contemporary history. Sets question-traps and uses answers of opponents to own advantage.
Presentation	Reads from notes more than 50% of the allotted time. Uses no more than 60% of the allotted time. Instead of criticizing ideas criticizes opponents personally.	Reads more than 35% of allotted time. Uses jargon language. Criticizes ideas using discourteous expressions. Infringes on the time frame by more than 10%.	Follows the structure *Introduction-Main part-Conclusion*. Uses his notes only for fact references. Addresses the audience, maintains visual contact. Infringes on the time frame by no more than 10%.	Follows the structure *Introduction-Main part-Conclusion*. Uses varied intonation and nonverbal messages for emphasis. Is courteous to opponents. Infringes on the time frame by up to 5%.	Uses original techniques for attracting attention. Observes the structure and the time frame. Is courteous to opponents.

the task of watching the course of the discussion and evaluating the knowledge and skills of their classmates with the help of the discussed rubric (we'll call them *observers*). This procedure allowed me to see and formulate one more academic goal of discussion: to develop the students' skills of observation and evaluation.

Experience with the debate program had warned me against assuming that simple observation over the course of a discussion would guarantee understanding of the role each participant plays in it. Therefore, in order to improve the quality of evaluation, I added one more tool to the rubric. This tool is called ***The Discussion Record Sheet*** (in formal debate, the English term *flow sheet* is used). Observers got blank sheets on which every speaker was allotted a column; during my class seven students took part in the discussion.

Speaker 1	Speaker 2	Speaker 3	Speaker 4	Speaker 5	Speaker 6	Speaker 7

In the course of discussion the observer should write down the ideas he hears from speakers in a corresponding column. By means of arrows, he can specify how these ideas are related to ideas stated by other speakers earlier. Using this tool makes it possible to recreate the semantic course of the discussion after it ends and to separate the content from emotional impressions.

After it became clear to all participants by what means and criteria the speakers' performance would be evaluated, a natural question came up about how to create equal opportunities for all speakers to demonstrate their knowledge and skills.

After some consideration, we developed the following procedure:

Each speaker will have an opportunity:

- To formulate a position
- To support it with arguments
- To pose questions to other participants
- To answer questions

Time frame of discussion:

During discussion each participant can use no more than 5 minutes.

Obligatory presentations (the teacher signals the time allotments):

- Two minutes for the first representation (stating one's position and arguments)
- One minute for the concluding presentation (developing one's position and arguments, giving conclusions in view of the ideas offered during the discussion)

Optional presentations (the speaker decides when to join the discussion and how many seconds to use):

- Two minutes can be split for short presentations and for asking questions of other speakers

Time of obligatory and optional presentations cannot mutually compensate (it is not possible to use a minute you saved from the first obligatory presentation to extend optional presentations).

This complicated time frame made us introduce one more role in the forthcoming discussion—we chose a timekeeper.

To ensure high quality performance of his/her duties, the timekeeper needed not only a watch with a second hand but some additional *tools* such as signs indicating *30 seconds*, *one minute*, and *STOP*, and a sheet of paper on which to record the time used by each speaker.

	Time used									
	5 minutes		4 minutes		3 minutes		2 minutes		1 minute	
	30 sec.	30 sec.	30 sec.	30 sec.	30 sec.	30 sec.	30 sec.	30 sec.	30 sec.	30 sec.
Speaker 1										
Speaker 2										
Speaker 3										
Speaker 4										
Speaker 5										
Speaker 6										
Speaker 7										

Having considered all the difficulties a timekeeper may encounter during a discussion, we developed some guidelines for this work.

Instructions for the timekeeper

Time is counted backwards so that it is easier, if needed, to let a speaker or an observer know how much time is left for the presentation.

As time goes by, shade the cells in the table corresponding to the name of each speaker.

Signs should be also put up in reverse order, to signify that a speaker has first "one minute" and then "30 seconds" left.

The "STOP" sign may be shown three times:

- After the end of the first obligatory presentation
- After a speaker uses the two minutes allotted for optional presentations
- After the end of the concluding obligatory presentation

After the end of discussion, declare the results of time expenditure to observers and speakers.

Post-discussion reflections

If we want to achieve real qualitative changes in the knowledge and skills of students (and in our own, too) it is necessary to talk about the process of discussion and evaluation with them. Sharing feelings and emotions is also important, as well as reflections about the discoveries made and ways of better using them in the future. During this conversation the teacher should encourage an atmosphere of openness and trust, and help students formulate their ideas. For example, if someone says, "I liked it," make sure you ask what exactly it was that the student liked. Remember to stress that such common words and phrases as *everything*, *good*, *bad* provide no helpful information, and in some cases can even provoke conflict as they may be understood differently. Once students are comfortable and familiar with structured discussions, such as the one described here, they will be better prepared to manage and monitor more informal and free-flowing discussion formats.

Here is what was said after our discussion in the history class:

- At first I felt a certain pressure knowing that my words would be recorded and evaluated, but then the discussion became so interesting that I stopped thinking about it.

- For me it was important to say what I had planned, that's why I did not think about who would be writing down my words or how.

- Though I did not participate in the discussion directly, when they talked about executions of aristocrats in France—whether those were justified or not—I thought that these executions could be compared with a surgery, when an injured or malignant organ is amputated for the sake of a person's survival. I was very glad when one of the speakers mentioned this [same analogy] in his concluding speech.

- I have noticed how many superfluous words my classmates say, and I'll try more carefully to avoid them in my own speech.

- To me as an observer, at times it was hard to understand whose ideas are picked up by this or that speaker.

- Sometimes I had the impression that supporters of different positions did not hear each other. For example, when it was said that revolutions promoted technical progress, someone responded that many people were killed. I still wonder how these two ideas are connected with each other.

- At the beginning I admired the presentation of the first speaker: his confidence, aggressiveness, activity. But when I began using the rubric for evaluation I understood that many of his ideas had not been supported by facts; therefore I can assess his performance as only satisfactory.

- The rubric helped me to prepare for the discussion: I rehearsed my first presentation at home so that it corresponded to the "perfect" level. For this I had to use not only the textbook, but also materials from the collection of original sources. It turned out that two minutes is enough time to say a lot. My expectations coincided with the evaluation of my classmates.

- Though my performance was not evaluated as highly as I had expected, I came to agree with this opinion because my classmates commented on it on the basis of the rubric and the discussion flow sheet.

This conversation and my personal observations allow me to make some conclusions and recommendations.

When using discussion for evaluation purposes for the first time in a class, choose a topic that allows you to devote enough time to procedural issues. For more difficult themes, the skills of both speakers and observers should be rather

advanced. Accordingly provide more time for "debriefing" or "unpacking," i.e., for the analysis of the whole process (discussion plus evaluation).

To make the work of observers simpler (and ultimately, to make the actions of a speaker clear for everyone), it is recommended that each presentation begin with signal phrases such as:

- My position in this discussion can be formulated in the following way…

- In response to the argument stated… I want to offer…

- It has been said (citation). I want…(to refute / to agree and add / to ask a question)

Students need to have a clear idea of what an argument is and be able to distinguish arguments from simple opinion statements. Many of my students had experience in debate and consequently, we based our evaluation on the model of argument they were well familiar with.

It consists of four parts: *claim*—a short statement in which an opinion is formulated; *warrant*—the connection between evidence and a claim, sometimes explaining some concepts used in the thesis; *evidence*—supporting the claim with objective facts, logical conclusions, opinions of experts, etc.; and *conclusion*—a brief statement strengthening the main idea (Hanson, 1996).

While students are still familiarizing themselves with how to monitor the discussion and record their observations on the Discussion Record Sheet, you might find it valuable to organize discussion in such a way that each speaker has a personal observer. The observer's task in this case is limited to making records of one student's performance only. Note, however, that while the procedure in this case is easier, it also means that each speaker will be evaluated by only one observer, which may lead to subjectivity and offense.

The experience described by me is not offered as a proof of the universality of these strategies. However, I doubt that any teacher would claim that he or she knows a strategy that is effective in all cases.

The number of discussion participants when speakers will be evaluated should not be more than eight; otherwise their opportunities to demonstrate their skills equally and sufficiently for the purpose of evaluation decrease sharply.

At first, preparing for a formal discussion of this sort (developing rules, time frame, and rubrics) takes a lot of time and does not guarantee against unexpected situations and mistakes. But it's the same as learning to walk, skate, or cycle—you can hardly do it without falling.

Therefore, if you simply want to check whether your students have memorized certain information, just offer them a traditional test—within 15 minutes you will receive a whole pile of work. But, if your interests embrace not only the ability of your students to use their (and sometimes other people's) memory, but also other important skills, I think it is time to start experimenting (if you have not yet started).

And then together we will be able to find answers to questions posed by practice.

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WebQuests: Supporting Inquiry Learning with Primary Sources

William G. Brozo

Within these columns I have purposely tried to limit myself to discussing strategies and practices that require little in the way of technology. I hope readers have appreciated my intention of recommending strategic moves that are feasible within all types of school and classroom settings, even those with very limited resources. In this issue, however, I have decided to propose and exemplify an approach to teaching that exploits the learning potential of the internet. Specifically, I want to talk about using WebQuests for learning from primary documents.

WebQuests are inquiry-oriented activities in which some or all of the information learners interact with comes from resources on the internet (Dodge, 2000). Think of them as focused searches designed to avoid endless internet surfing and ensure that students find, quickly and efficiently, web-based source material for answering questions and conducting research. Primary documents are those texts written by and about individuals and groups who experienced the events of history, made or were affected by the discoveries of science, or logged the development of their own ideas leading to, for example, new geometrical principles in math and engineering. They include authentic pieces of text and media such as letters, photographs, journal notes, blueprints, and drawings. These vivid and personal documents have been shown to intrigue students and provoke thoughtful and engaged responses (Barton, 2005; Hynd, 1999). It is worth noting that American students who read primary documents on a fairly frequent basis, as often as at least once a week, achieved higher scores on a national assessment of history than their peers who rarely saw these sources (U.S. Department of Education, 2002).

Designing a WebQuest

Beyond the obvious requirement that students have access to a computer with an internet connection, there are six key features of WebQuests teachers should include in their design (Shiveley & VanFossen, 2001). Normally, students find WebQuest information, directions and questions at a class website, which makes it easy to explore sites by simply clicking on the available links. If necessary, however, this same information can be delivered to students in handout form.

1. *Introduction*. It is important to provide students with background information that gives them the purpose and expectations of the quest. For example, a history teacher might set the stage for a WebQuest of primary sources during the time period of World War II by briefly defining these sources, giving examples, then outlining the goal of the quest.
2. *Task*. The WebQuest should be something the students are capable of doing, given available resources and skills, and it should be engaging. The history teacher could describe the World War II WebQuest task this way: *I want you to explore different WWII websites provided for you. These sites make available many interesting primary documents from people who actually experienced and witnessed the war. Read and examine the documents so you will have a better understanding of the realities of wartime life.*
3. *Information sources*. Depending upon the sophistication of the available computer technology, information sources in addition to web documents could include experts available via e-mail or real-time conferencing and multimedia. To make sure students are not left adrift in cyberspace, the history teacher can create the links to sites for them. These links might take students to an actual diary of a soldier in Central Europe, an oral memoir of a grandmother recounting her childhood experiences during the war, actual newspaper reports and editorials, movie clips, and transcripts of presidential addresses.
4. *The process.* This should spell out in clear detail the steps students need to follow in order to accomplish the WebQuest tasks. For example, the history teacher might present students with these charges:
    1. You will work in groups of four.
    2. Each member of the group will be responsible for reading and/or viewing one of the primary sources.

3. Each group member will analyze his or her source for what it reveals about the writer's or speaker's attitude toward the war, and write a brief summary of the analysis.
4. Create a group report that combines the group members' individual analyses into an overall summary.
5. Elect a spokesperson from your group to present your report to the class.

5. *Guidance*. Students may need help with organizing the information acquired or with knowing how to approach their analysis of it. Teachers have referred to this feature by other names, such as *learning advice* or *helpful hints*. The history teacher could provide needed guidance in her WebQuest in the form of helpful suggestions that keep students focused on the connection between the writer's or speaker's words and attitudes. For example, the history teacher might pose these queries about a primary source: *What particular words do you find in the source that indicate a bias? How close to the actual war were the individuals and how might that influence their perspective on the war?*

6. *Conclusion*. This feature brings closure to the quest by reminding students what they learned and encouraging them to extend their new knowledge. Concluding statements can be as simple as this possibility from the history teacher: *Congratulations. You are now more familiar with World War II as a result of using primary sources. You are also able to analyze primary sources for what they reveal about the writer or speaker. As you continue your learning and researching, use primary documents and sources to better understand the people and events.*

A final word about the benefits of WebQuests

In typical disciplinary classrooms today there remain two ever-present, authoritative information sources—the teacher and the textbook (Brozo & Simpson, in press). This seems to be true regardless of the availability of technology tools. However, teachers can increase student engagement with and critical thinking about topics in the disciplines by introducing them to interesting primary documents and media using the internet. Properly designed WebQuests eliminate for students the often inefficient process of surfing the web, while making available the specific URLs with valuable primary sources. With these sites already identified and tasks clearly described, students can focus their attention on analyzing and thinking meaningfully about the sources instead of meandering through Webspace.

It is easy to see why primary sources, which were difficult to locate and copy, rarely found their way into most classrooms before the availability of web-based tools. The internet makes instantly accessible to teachers and students every imaginable primary source related to any school-related topic. Teachers who employ WebQuests will see firsthand that primary sources are more attractive and engaging to students than traditional textbook treatments of topics, and promote meaningful and long-lasting learning (Lawlor, 2003).

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