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Democracy must be born anew in each generation, and education is its midwife.

John Dewey

THINKING Classroom

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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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Letter from the Editor

Alison Preece

Photo from the author's archive

Talking *With*: The Heart of Teaching

Recently, while sorting through the proliferating piles of papers that seem the inevitable accompaniment of the academic life, I came across a quotation I had tucked away, years ago, for safekeeping. It struck a chord for me then, and does again now. The words of the late Garth Boomer, a deservedly influential and much missed literacy educator from Australia, cut through the clutter of the overburdened, often frenetic, curriculum that is the daily reality for too many teachers and students to remind us of the simple things that should lie at the protected heart of teaching. He wrote:

> *In a time of increasing complexity in society, I crave simplicity in schools. Simplicity that values conversations between teachers and children . . . . simplicity that allows time to talk about the way the world wags; simplicity that spurns the enticing laboratory and exercise books, preferring the humble wisdom of the teacher and the real materials of life.* (Boomer, 1973)

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"Simplify, simplify." H.D. Thoreau
"One 'simplify' would have sufficed." — Ralph Waldo Emerson, in response.

From *Let My People Go Surfing*
by Yvon Chouinard

Although most classrooms have moved far from the "sit-still-and-listen" model that used to pass for instruction, it's worth asking ourselves just how much space and provision we make for *real* conversations between teachers and children, or amongst students. These would be conversations that move beyond the exchange of superficial or safe observations; conversations that make possible the raising and airing of issues that we as individuals truly care about, get excited about, worry about, or can't make sense of. A few years ago a teacher taking one of my graduate courses conducted an informal survey; she asked students in Grades 6 and 7 whether they ever had a chance, in any of their classes at school, to talk about the things they wanted to talk about and considered important. Overwhelmingly, distressingly, the answer was "No." Several students went on to comment that it was the teacher, and only the teacher, who chose the topics for discussion, and that most discussions were more a ritualized exercise than any genuine exchange of views. Sadaf Pourmand, a Canadian high-school student, made a similar point in her response (in issue 8-4 of this journal, p. 6) to the question of whether schools were preparing students for the complexities of the world they would inhabit. Her stance was unequivocal: "From my point of view, school barely talks about different cultures, racism and indigenous peoples' issues. When they do talk about these things, they talk about them only in the past tense. They never speak about how the issues are still here in the present. They stick to textbook material, and not social concerns relevant to the life of the community. . ."

I can't help wondering what's lost, what's at stake, if these conversations don't happen. What's lost if we fail to make space, and take time, to hear each other out, and find ways to actually *listen*? Where else, if not in school, might we *learn* how to uncover, probe, question, sort out and weigh up, navigate and negotiate the opinions, perspectives, and positions of those we must live and work with? At what cost do we stick to textbook material that may not touch on the things central to our students' lives and the realities they're grappling with? And what do our students lose if we don't share with them the issues that *we're* grappling with— and why?

I'm not naive about the challenges that we all face as teachers in bringing about such conversations, and far too often I leave my own classes knowing that I've talked more than my share, frustrated when what I thought should have been a provocative and rousing discussion turned out to be flat or pedestrian, involving only the same few who always take the floor. There are many factors that work to derail even the most sincere efforts to engage students in meaningful conversations. With large classes it is a struggle to know all the students by name, never mind finding out enough about each one to relate as individuals. Peer pressure can be a powerful inhibitor. The curriculum can be relentless in its demand to be covered. Not all discussions will be grand conversations. Nevertheless, it matters enormously that we try.

Boomer (1973) asks not just that we make room for "conversations between teachers and children," but that we value those conversations. It seems to me that this requires recognizing that there are things that we, as teachers, will never know or understand about our students if we neglect to invite them to tell us. Similarly, it requires recognizing just how important it is that our students have opportunities to learn how to participate in frank, extended, exploratory discussions on matters they care about; that they learn how to counter and challenge a position they find lacking; that they learn how to embrace and build on the ideas offered by others; that they experience directly the virtues of judiciously and gracefully abandoning a previously held idea in response to a genuinely *better* idea proffered by another. All of this can be learned… or not, if the occasion to do so isn't offered. As teachers, we're uniquely positioned to make such conversations central to our teaching and to our students' learning, challenging though it may be. My experience is that students are hungry for such encounters—and acutely aware of their rarity. As St. Augustine reminds us, talk *with* is a powerful teacher: "I learned not from those who taught me but from those who talked with me." Taking my cue from Boomer, in these times of increasing complexity in society, I also crave simplicity in our schools—the simple recognition that talk, real talk, between teachers and students, *is* teaching.

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Patricia Bloom, David Klooster,
Asone Wollor, James Harris, and John-Paul Noah

The Role of the Humanities in Post-Conflict Societies, or Do They Need Poems Here?

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The art of reading is in great part that of acquiring a better understanding of life from one's encounter with it in a book.
Andre Maurois

According to the novelist Zadie Smith, the street scene in Monrovia, Liberia, is "post-apocalyptic." Following fourteen years of civil war, the streets of this West African nation are lined with war-damaged buildings, and populated by large numbers of unemployed citizens in search of work or food for their families. Everywhere young men stand around, waiting. Much of the infrastructure of the country is in shambles. There's very little electricity, and no running water or functioning sewage system. The roads are often impassable, the health-care system is inadequate to the needs of the people, and the schools are struggling to cope with inadequate buildings, a dire lack of textbooks, and poorly trained, though courageous, teachers. Ports, sanitation systems, government buildings, factories, public transportation, agricultural systems—all of these have been heavily damaged by the war. To an outsider's eye, it seems as though the country needs everything, all at once.

Even before its civil war from 1989-2003, Liberia had a complex history. Founded by freed U.S. and Caribbean slaves in 1847, Liberia was governed by a small minority of "Americo-Liberians" until 1980, in a society that reproduced many of the same master/slave and powerful/oppressed dichotomies of injustice that were part of the U.S. system on which it was modeled. Then, following a violent coup d'etat in 1980, a decade of military rule brought unprecedented levels of corruption and violence to the country. A brutal civil war ended in 2003, when the UN sent in a peace-keeping force. Approximately 250,000 people were killed during the civil war, many at the hands of some 36,000 child soldiers. For all the ways in which Liberia's history is unique, its current anguish is representative of many places around the globe, countries that are dealing with the aftermath of unprecedented violence and inhumanity. Now, the country is engaged in the arduous process of rebuilding everything, from its physical infrastructure to its academic curriculum, under the leadership of Africa's first-ever woman president, Ellen Johnson-Sirleaf.

In Liberia, as elsewhere, generous donors are making an enormous difference in the lives of the people. Doctors without Borders is active in many places, providing, along with faith-based organizations and other Non-Governmental Organizations (NGOs), 90% of the health care in the country. Their services range from treating cholera patients, to disease prevention (especially prevention of HIV/AIDS), to treating victims of gender-based violence. Dozens of other NGOs are engaged as well, providing everything from rural water systems, to sustainable agricultural practices, to training for police and military, to small business assistance. Over all of this, a 15,000-person United Nations peace-keeping force presides. Many Liberians believe that if the UN withdrew now, the war would resume.

A number of interconnected issues influence the work of all of these development agencies. Poverty reduction is a central concern in this nation, where 85% of the people are unemployed and 80% of the people live below the poverty line of $1 (U.S.) per day. (For a snapshot of the economic situation in Liberia, see the *CIA World Factbook*.) The reduction of violence is a high priority; the country is full of guns and weapons, the result of foreign "aid", mostly from the US, in an earlier Cold War era. The legacy of gender-based violence is a special cause for concern to many of these development agencies, as there are so few psychological health resources in the country. Education (particularly for girls), environmental stewardship, and HIV/AIDS are other topics of concern to every agency working in Liberia. These issues have an impact on every project, whether focused on health, economy, civil society, or education.

Does poetry belong in this list of critical issues? Do the texts from the humanities have anything useful to say here? Does the practice of reading and writing about such texts have any immediate relevance in the Liberian context? Can literacy educators contribute something meaningful in a place that needs everything, all at once? This essay is a meditation on these questions, and thus, in a sense, it is an inquiry into the larger social and political meanings of the work of educators involved in the teaching of reading, writing, discussion, and critical thinking.

Reading, writing, and critical thinking in post-conflict societies

We arrived in Monrovia, Liberia, in late summer and again in early autumn, 2007 (or in a more Liberian way of putting it, late in the rainy season and at the very beginning of the dry season), to provide workshops for school and university teachers, offering ideas about teaching reading, writing, and critical thinking.

We came with backpacks full of stories, poems, discussion activities, role-playing exercises, writing assignments, and lesson-planning strategies. Even though we were deeply committed to this work, and had the confidence built by ten years of similar workshops in other parts of the world, we got off the airplane, looked around, and thought, "Do they really need poems here? In the midst of all of these needs, what do we actually have to offer?"

Suppressing our self-doubts as well as we could, we began the reading and writing workshops with 25 warm and welcoming new Liberian colleagues, representing the University of Liberia and four other religiously affiliated universities in Monrovia. These intelligent and kind colleagues quickly helped us to see Liberia not just as a needy country, but also as a place with much to offer. Although these teachers wanted to learn what we had to teach, we also realized that these educators, whose dedication to their profession had survived extraordinarily difficult conditions during the war, had much to teach us.

Our African experience helped us see anew how the creation of a public library and book lending can be an act of courage and of wisdom, how poetry

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speaks to bruised lives, and how putting thoughts and words to paper can be a way to lay hold of reality, a way to create structure and meaning out of chaos, an act of hope. We also learned anew that a humane classroom where participants share ideas, tell stories, listen carefully to one another, read and reflect on worthwhile texts, and even eat, sing, and celebrate together—that kind of classroom is a place that builds the shared humanity of its members.

As in critical thinking workshops elsewhere, we found a ready willingness among our Liberian colleagues to engage in the give-and-take of discussion and debate about the texts we had selected. But unlike our workshops in other places, here we selected texts not about sealskins and sea turtles, but about girls' education, children and war, and environmental preservation. We brought poems that provided opportunities for discussion about survivorship and remembrance of loss. We asked participants to write about topics that touched on societal recovery from trauma and the rebuilding of the country. Most of the texts were not directly about Liberia. We selected a poem about an African American slave, an article about education reform in Mali, and a poem about the war in Vietnam. But the workshop participants quickly forged connections between the texts and their own experience. Although the workshop ostensibly focused on reading and critical thinking, we found that texts that raise the crucial issues being addressed by all the development agencies are highly significant for these university professors as well. As the clock hands turned, it felt to us that our time together became a small but vital part of the larger project of social and cultural recovery after the war.

Still, our questions lingered. Do they need poems here? Is there a place for books in the recovery efforts of a nation trying to rebuild after war? Others have asked similar questions after other wars, perhaps the most famous being the Jewish-German journalist, Jella Lepman, who had the difficult job of addressing the educational and cultural needs of German women and children after World War II, as part of the reconstruction effort. Her answer was to persuade the Western world to send to Germany children's literature, especially illustrated tales that showed children another reality and provided answers to their spiritual questions. "For many years, covering the Second World War period, the only reading material most German children had had access to was propaganda of one sort or another," states Mary Robinson, the UN High Commissioner for Human Rights. "Lepman… empowered children in one of the most efficient and effective ways, by ensuring that they had access to books in the very difficult context of post-war Germany" (Lepman, 2002, p.4). Although *Thinking Classroom* authors Barath and Sabljak (Spring 2001, p. 4) wrote from a clinical perspective on the Croatian war, they too suggest that literature and the right texts can be "a powerful tool for helping distressed children in the midst of war and long after" (p. 15). But in Liberia, we were working with adults in teaching workshops. Could the poems we brought speak to the trauma of a teacher participant whose daughter was abducted by rebel soldiers and forced into an unspeakable life of sexual slavery for well over a year? Could our essays address the grief of a man whose elderly mother was purposely shot, singled out as he was trying to bring her across the border to a refugee center? What difference could literature make to a young, dislocated teacher returning to his homeland after three years in a refugee camp?

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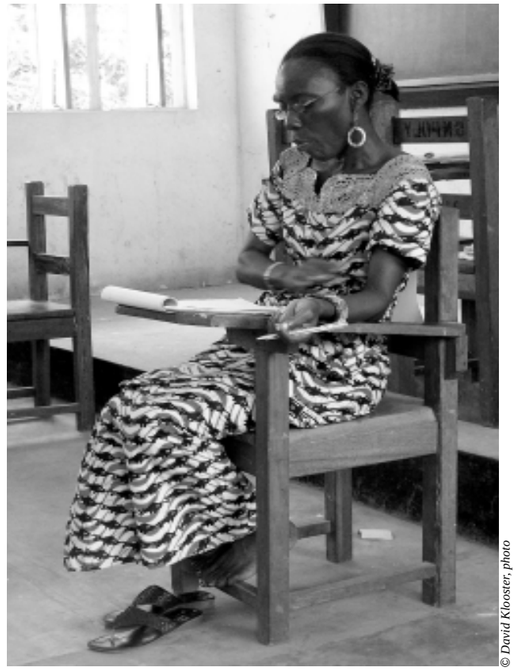
In Monrovia we witnessed a number of examples of people's efforts to use words as a way to move forward. Visitors are struck by the numerous signs around the capital city urging progress. "Our youth need good education and jobs, not weapons," proclaims one billboard. Another says, "Don't stop the women. They can contribute!" Many hand-painted signs counsel against sexual violence. A few, evidently provided by the government, promise new roads and street lights as a result of the recently enacted tax laws. But other evidence of the power of words can be found as well.

The WE-CARE Library, the only library in the country open to the general public, is, despite its bullet holes, a gem of a place [see page 12 for a fuller account]. Run by Michael and Yvonne Weah, two teachers who participated in the workshops, the library has been a refuge for people seeking to escape the violence of the streets, a place to consider human interactions throughout Africa, and a place where people can read to make sense of their lives. The library is a resource not only for reflection and escape, but also for protest, activism, and change.



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One of the books available at the WE-CARE Library, a book now widely known in the United States, is Ishmael Beah's *Long Way Gone: Memoirs of a Boy Soldier* (2007). Beah's narrative takes place during the years when Liberia's civil war bled over the border into neighboring Sierra Leone, and his experience of three painful years as a boy soldier surely mirrors that of many Liberian boys. Forced into the rebel army at the age of 12, Beah both experienced and committed atrocities. He was lucky enough to be turned over to a UN rehabilitation center, and later offered a chance for an education. His memoir is an account of those awful years of warfare and recovery, but it is clearly also Beah's attempt to gain control over his life, to use words to relieve suffering and move forward. Beah used the opportunity he found in a writing workshop to claim a small piece of order and meaning—a small bit of

humanity—from the raging inhumanity of the Liberian and Sierra Leonean civil wars.

All of our participants had found their teaching and reading lives disrupted for years; they had been unable to keep up in their fields, and had been unable to teach regularly. Many of them, like many teachers around the world, had not seen themselves as the kind of classroom educators who included their own writing as part of their professional identity. Coming from a variety of disciplines, including theology, psychology, math, and electrical engineering, most of them had never formally taught writing. Even the English teachers seemed more concerned with grammar and the parts of speech than with composition. Thus, we were very explicit in outlining the writing process, and broke down each task for analysis.

We began with a model essay by Ophelia Lewis, an expatriate Liberian, called "Picking up the Pieces," from the Liberian Writer's Network website. It seemed fitting to read this essay about recovery from the war in a room that itself was scarred by the war—a former science classroom where the laboratory tables had been ripped out by looters scavenging for copper tubing and wires; four years after the war, the broken windows had not yet been repaired. Collectively, we analyzed the essay for the argument it presented, but also for the way the author crafted her argument and made use of rhetoric. Many of us were especially struck by the effectiveness of Lewis' use of a repeating line to begin each paragraph: "We must pick up the pieces of hope. We must pick up the pieces of joy. We must pick up the pieces of dignity. We must pick up the pieces of prosperity."

We invited our participants to find their own topic, by using an exercise called "Things I Might Write About," brainstorming various ways in which we could imagine education contributing to the recovery of Liberian society. The writers gathered in small groups and shared the most promising items from each person's list, and then talked about possibilities and potential drawbacks for each topic. Next, a clustering exercise helped the writers develop their ideas and elaborate ways to support their main ideas. We asked the teachers to try out three or four possible repeating lines like Lewis's "We must pick up the pieces" and heard many promising possibilities in the discussion: "Now is the time for..." one man offered as his lead line in each paragraph. "We have too long suffered," another tried. "Everywhere I look, I see..." a woman suggested.

Before we broke for a lunch of fish stew and rice, we all took 45 minutes to write a first, tentative draft of an essay on the role of education in picking up the pieces of Liberian society.

After lunch—during which we overheard a number of conversations about what schools can do in local communities to begin rebuilding the country—the writers read their drafts to one another in small groups. Another brief period of revisions, editing, and recopying followed.

The result was a selection of fine essays, a mere five hours after beginning the whole process. What we witnessed was the power of an essay to organize and illuminate chaotic experiences. None of the essays attempted what Ismael Beah had done, taking the experiences of their lives and helping readers to see what it was like to live through the war. Instead, they focused on what they as

PICKING UP THE BROKEN PIECES

De-traumatizing the War-Affected Liberian Children

Asone Nah Wollor,
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The fifteen-year civil crisis in Liberia affected everybody, but most especially the children; therefore, we need to restore our children's education. The education they need is not only how to read and write, but to learn how to live moral lives in society.

Our children who were affected by the war that stretched from 1989 to 2003 will never benefit from effective education if their minds are not turned around. They must feel accepted and respected by their communities. Many of our children have experienced the war and participated in the war in many terrible and horrible ways. Some of the children's parents were murdered in their presence. Mothers and sisters were raped, dehumanized, amputated. Families' property was vandalized and looted. In revenge, some of the broken children picked up arms, making them both perpetrators and victims of violence.

We need to restore childhood. The schools must put programs into place to help our children cope with the day-to-day activities. Both schools and instructors need to restore these child perpetrators and victims, socially and morally. We need to restore the broken hearts and minds of our children. The underprivileged, down-trodden, homeless, the disturbed and violent children's hearts need to be comforted and stable. Their lost dignity needs to be restored.

We need to restore love and reconciliation among the child perpetrators and victims of war-affected children. We need to teach them God's love—teaching them to treat one another with love by putting the past behind. Forgetting about the past and treating one another with love will bring reconciliation. After rehabilitation, healing of the painful wounds and reconciliation, integration will take place.

We need to restore hope to the less fortunate ones. Education, especially quality education, is very, very expensive in Liberia. We need to empower the less fortunate financially in order to achieve quality education. We need to give them hope for a better future. We need to place them among their peer groups where they will be respected and accepted.

We need to restore the assurance of forgiveness and acceptance. After confession and repentance comes forgiveness. Let the child-perpetrators and victims be informed that God loves them; therefore, they should forgive one another. We should forgive the war-affected children as parents whom they have victimized. Let us accept and respect them because God has forgiven these child perpetrators and victims who have committed atrocities against humanity. This gives hope of happiness and security in the community in which they live.

Our children who are traumatized and less fortunate can never be effective learners if nothing is done about their situation. We need to put the broken pieces together through healing and counseling, and we must restore dialogue between perpetrators and victims. As instructors in schools we need to give children hope for a better future.

PICKING UP THE BROKEN PIECES

The Rebuilding of Schools as We Pick up the Broken Pieces

John-Paul Noah,
Stella Maris Polytechnic University, Liberia

The Liberian Government is in the process of picking up the broken pieces in transforming her educational sectors. In my view, it is important to revisit the structure or design of her various schools. Because the physical environment plays an essential role in the learning and the minds of students, our primary and secondary schools and our universities should be built up to an international standard. The buildings themselves would then enhance the enthusiasm of students to learn. Carefully built, beautifully created physical spaces make children realize that education is good. Everyone would boast about the structure in which they learn if the building included spacious classrooms, libraries, laboratories, and cafeterias. Meanwhile, these structures would motivate the minds of students as we pick up the broken pieces.

Raising the Quality of Education in Post-War Liberia

James G. Harris,
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Roses, fresh in their sweet scent and beautiful during the morning hours, lose their qualities when they wither as the sun becomes hot. Yet, the next morning, they revive. So the Liberian educational system must revive. Unlike the short life of roses, we must revive the withered education system for the long term in post-war Liberia.

During the 1960s, 70s and 80s, Liberian schools could boast of relative strength in terms of their ability to develop the cognitive, affective, and psycho-motor domains of each student. Those days, the school atmosphere was characterized by commitment. Those days, all stakeholders—teachers, school administrators, students, parents, guardians, political leaders—were committed to the teaching–learning process. Those days, strict discipline to encourage moral virtues and academic excellence was common. There were few negative influences, internal or external, that interfered with that discipline. All stakeholders worked in concert to maintain a high quality of learning.

Unfortunately, learning has diminished in quality since 1990 when the war began. Hence, it is extremely important that we, citizens and residents, join hands to upgrade the quality of learning in Liberia now!

What I view as key components of quality education in Liberia?

If the Liberia of today is to restore quality to its educational system, it will require the integrated contribution of five key factors: *substance*, *dedication*, *integrity*, *choice*, and *means*. After over twenty years in the classroom, some of this time as a student, some as a teacher, I have witnessed many dismaying lapses and backwards steps. However, I have also been exposed to these factors that sustain my hope for high-quality education in my nation.

Substance is foundational to quality education. Teachers today tend to think of substance as the amount of standard information to be taught to students or the amount of knowledge to be imparted to them. But far from simply presenting this information to our students, substance requires that the information be meaningfully engaged by the learner: that it be something observed, discovered, interpreted, explained, verified. The substance of quality learning is more than just what the teacher says, what is written on the blackboard, what is assigned in the text. It is also what is learned through in-class interaction with friends, through thoughtfully designed homework, or most appropriately during a student's personal study.

Dedication is commitment to a cause or an idea, and the placing of such an idea above the individual's other interests and dreams. A dedicated teacher or school administrator will say *no* to a bribe, even if this refusal moves him several steps further away from his dream of owning a house or a car. The dedicated student will intensively study his lessons, and make sure that competing desires—to spend time with friends, go to bed early, or simply relax—don't erode the time needed for study. The dedicated student will do the hard work necessary for learning, rather than spend that time contacting influential people—parents, political leaders, etc.—who can do him a favor if he fails to reach his goals through his own efforts. Dedicated students, school administrators and teachers together will create a clean and environmentally friendly campus where learning will be a way of life and teaching becomes a pleasure.

Integrity is closely related to the preceding two factors. But it helps to keep them separate since integrity, more than anything else, determines the quality of the education system. The student of integrity stands by what he earns, accepting an honestly achieved mark of 69 and resisting the temptation to raise it through cheating. The teacher of integrity will award the mark honestly earned, and never treat marks as currency to be exchanged for favors. The student of integrity learns beyond the minimal expectations, beyond the informational content of the syllabus. He learns to be a trustworthy and contributing member of human society.

Choice is a distinguishing feature of high quality education. Clearly, students cannot learn everything nor teachers teach everything: Choices must be made. The responsibility lies with all of us to make such choices wisely, and for reasons that benefit the greater good. Both teacher and student should work together to create and maintain high quality in the teaching–learning process.

Means (resources) are an unavoidable issue, and also an essential element, in the education process. Schooling costs money, and someone has to pay for it. However, even if school is free, there are still inequities. No one should go to school barefooted. No one should attend classes unable to write notes due to a lack of notebooks. Without resources, then, and fair access to them, high quality education for all citizens will be unrealized.

In giving my view of high quality education, I have made a case for what it *should* look like. I cannot state for certain that such an education currently exists anywhere, or even if it is now being created. My conviction, however, is that we Liberians must be ever vibrant as we search for it.

teachers could do, and what their schools could do, to help their society function again. Many of these writers volunteered to read their essays from the Author's Chair.

As we wrote, and as we listened to the many participants in the Author's Chair, we saw that despite the evidence of the war in the blown-out windows and bullet-hole-riddled walls, we were sitting in a humane classroom—collegial, friendly, encouraging—a place to get one's bearings, to reestablish a professional identity, to rebuild relationships with fellow teachers, fellow citizens.

Judging by how many of the participants were eager to share their words, either with one another in pairs or with the entire group from the Author's Chair, and judging by the warm reception they gave each others' essays and ideas, this writing workshop was a powerful experience in using literacy to find answers and direction. In our war-damaged classroom, for an hour one October afternoon, it was evident that the poems we had read together, the stories we had told one another, and the essays we had written had together contributed to the re-formation of a community of educators, to the reestablishment of professional identities, and to the rebuilding of at least one small part of the education sector in Liberia.

It was empowering, even dizzying, to hear their final comments, such as this anonymous note written on an Exit Card at the end of the workshop, "I never thought I would be an author, but today I became one."

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M. Woryonwon Roberts

WE-CARE Library

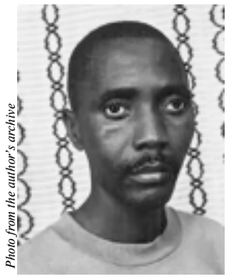

Photo from the author's archive

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The year was 1992, and Monrovia was engulfed in a civil war. A typical day began with the sound of gunfire shattering the silence—the silence that people had hoped would bring peace. The day was filled with the movement of displaced people from one end of the city to another in search of food, and was rounded out by a curfew that began at 4:00 p.m. and lasted until 7:00 the next morning, when the routine began all over again.

It was in the midst of all of this strife that a few Liberians and friends of Liberia decided that they would provide some pastime for the long hours of the curfew, when people were forced to be in their houses behind closed doors. They decided to start a book chain, through which they would provide books to the people; after reading a book, each person would pass it along to another, thus continuing the chain. Many people in Monrovia were part of the WE-CARE Book Chain, and enjoyed its books and magazines during those long hours indoors.

One of WE-CARE's success stories features a man who had been part of the chain, and who had subsequently emigrated to the U.S.A. After ten years there followed by a sojourn in Iraq, he had returned to Liberia. During a speech celebrating the release of a book he had written, he had this to say about the WE-CARE Library: "It was here it all began. In those dark rooms under the flicker of candles, I got to appreciate what it meant to be able to read, but most importantly, [to appreciate] having something to read. Today, I too want to contribute a book which I have written." We have his book in the library.

That is where WE-CARE Library began in 1992. Today, she has evolved into a small library in the inner city, and is proud that more than 3000 people from all walks of life, including students, use her facilities every year. When most people think of libraries, they first think of books; and with good reason, for books are the most visible of any library's holdings. But in addition to books and journals, the WE-CARE Library, like any modern library, has an audio-visual room and a computer section, which provides free access to a world of multimedia information and education. Members and visitors to the library can use the Internet, take out children's books and novels, do research for term papers, and read current editions of assorted magazines and local dailies for information about events in their respective communities.

Her greatest hope and mission is to establish similar reading rooms/libraries in rural areas, as a source of reading material for entertainment and information. This mission is based on the truism that a reading people is an informed people, and that informed people make informed decisions that affect their social and economic condition.

The location of the WE-CARE Library in the inner city, where "everything" happens—for instance, all the glass in the windows was stolen at one point, and businesses with service names like "Only God Knows" deal in stolen properties and blatantly offer their goods, and young men lounge on the street corners—provides the library with a unique set of users. When they come in off the street to use the Internet to find out the latest football scores, the staff go over and engage them in locating the countries from which their favorite players hail, providing information on basic geography.

Such occasions illustrate and confirm why we feel it is worthwhile that the library is *here*. Just coming to the audio-visual room and remaining to watch the news, and hearing these young people make comments and argue on local or international events, provides a lot of insight into why WE-CARE exists.

The WE-CARE Library is the only library in Liberia open to the general public, with the distinction of having all services absolutely free of charge—providing access to books and information to a population where more than 90% are unemployed and most people live on less than a dollar a day. WE-CARE does not want a child to have to choose between the reading of a good book and a cup of rice. On average, the library receives over 75 people daily in a space that allows for 40 people to sit comfortably. Twelve schools (elementary and high schools) affected by the war, that have no libraries, use the WE-CARE Library as *their* library.

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Yvonne and Michael Weah, teachers who run the WE-CARE Library

The WE-CARE Library is a great place and is doing well for many students and researchers across the country. It needs to continue the good work. I was introduced to the library by one of my classmates in 2000. Since then, I've been a regular attendant. I did all my high school research here. Today, I am doing my university research at the library.

Kanneh Fombah*,*
Student,University of Liberia

I think the availability of requisite textbooks and resource materials at WE-CARE greatly helps many students, teachers, writers, etc., in researching or accessing information. The ideal location of the library provides an opportunity to many of us to build up a culture of reading, especially during leisure times. I wish WE-CARE Library would grow into a larger one to accommodate many more users. I wish also that it would spread in various communities across the country.

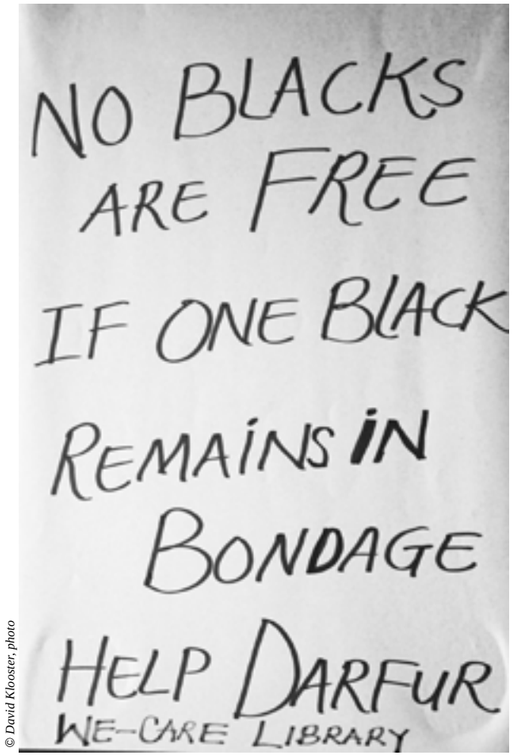
E. Herodotus Payne,
Writer & Freelance Journalist

WE-CARE Library is doing extremely well by providing services free of charge to students and the public to do research. I got to know about the library through a friend. I make use of the library everyday. WE-CARE, keep up the good work.

Abib Zack*,*
administrator, Holy Family Services

I feel good about WE-CARE Library because it helps us do our school works by having easy access to information/resource materials. Having access to the Internet too is a plus. Two thumbs up to WE-CARE.

Dabbah Gbessay*,*
Student, St. Teresa Convent (an all-girl Catholicschool)



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I think the library is the best thing to happen to us in this community. I spend an awful lot of time at the library reading or using resource materials to finish up on some school work, report, or writing project. I wish WE-CARE was in every community across the country. I look forward to that.

***Boima A. Kamara**,*
Teacher, Muslim Congress School

I visit the library almost every day to read. I am grateful for its existence; proud of its kind and dedicated staff. Best of all, I feel privileged to have free access to the internet and to a world of multimedia information. Certainly, WE-CARE is a blessing to many Liberians.

***Thomas Kpiah**,*
Social Worker

I want to thank the staff of WE-CARE for their tireless efforts and invaluable services to the public. They go out of their way to get us satisfied by making available to us the needed information. I have grown to love to use the library all the more.

Felecia Gbarh,
G.W. Gibson School

The WE-CARE Library sponsors the following community activities:

- It organizes programs and discussion forums.
- It conducts a reading program called Story Hour for Kids in less fortunate communities and neighborhoods. This program, which teaches children to read and love books, is based on the premise that reading children become reading adults. The Story Hour for Kids program is WE-CARE'S way of addressing the 80% illiteracy rate that affects Liberia today. The future of Liberia lies with the children, who currently comprise about 60% of the population.
- It conducts computer literacy classes for teachers, school staff members, members of the Liberia Association of Writers (LAW), and others.
- It is affiliated with a number of community-based organizations, and provides a meeting space for the Liberia Association of Writers (LAW) and many other groups.

The WE-CARE Library is owned and operated by the WE-CARE Foundation, Inc. The foundation is a local, not-for-profit, educational organization that is lending a helping hand by giving something back to the community, e.g. it distributes books to schools in rural areas/disadvantaged communities across Liberia.

In conjunction with the Liberia Association of Writers (LAW), WE-CARE is launching a nationwide reading program with the theme, "The Year of Reading and Writing: 2008."

All WE-CARE activities are being coordinated by two permanent staff and three volunteers, and others are hired on an ad hoc basis to implement the programs. The goals and objectives of WE-CARE are best reflected in its mission statement:

- To sensitize the public by providing information for rebuilding, on firm humane principles, the social structures in the health, education, and economic sectors, which were destroyed in the Liberian civil war.
- To develop a love for books and a love for reading among the children, as a means of reducing the illiteracy rate in Liberia to a level at which Liberians can meaningfully participate in the knowledge-based economy that runs the world today.

As the accompanying statements from those who have used WE-CARE make eloquently clear, the WE-CARE Foundation is more than living up to its mandate.

REPUBLIC OF LIBERIA
MINISTRY OF EDUCATION
P. O. BOX 10 - 9012
1000 MONROVIA 10, LIBERIA
WEST AFRICA

Office of the Deputy Minister for Planning and Research

To Whom It May Concern

Every time I enter the WE-CARE Library, it brings back memories of the time when, as a kid, I spent a great deal of time at the US Information Center, reading or using their reference materials to finish up on some school assignment. Also, when I realize that the WE-CARE Library has existed all through the civil war providing stimulants for the minds and keeping the light in the name of the love of books and the search for knowledge, my belief in books as a tool for unlocking the universality of mankind is strengthened; and I become more determined to create the same conditions for the newer generation. That is why I am resolved to support the efforts of WE-CARE Library as it contributes towards the building of a resilient Liberian people.

WE-CARE PROGRAM – The Story Hour for Kids – that teaches children from the less fortunate community to read and seeing kids reading here in the library and having access to the internet, with all services free to all comers in a country where the income of the people is less than a dollar a day, say that all is not lost.

The ministry continues to look to such organizations as worthy partner in her endeavor to give hope and opportunity to the children of Liberia; and encourages people and organizations interested in this kind of nation-building to support the WE-CARE Library.

Sincerely,
James Emmanuel Roberts
Deputy Minister for Planning, Research & Development,
Ministry of Education, R. L.

How do you ensure that evaluation is a positive experience for your students?

***Kim Anic**, Psychologist, Headmaster of Elementary School "KOZALA," Rijeka, Croatia.*

When we define certain educational tasks and goals, it is not enough to use vague terms such as *know*, *learn*, and *understand*, because "if we don't know where we are going, we could get lost." Different types of learning demand different skills, different teaching strategies, and different methods of evaluation. If the terms we use to define our goals aren't precise enough, it is hard to know how to evaluate learning outcomes. We need to evaluate critical thinking skills like comparison and analysis, instead of just focusing on rote memorization and facts. When we wish to model positive evaluation skills for our students, our goals should be to compare, to conclude, to distinguish, to criticize, to discriminate, to explain, to judge, to evaluate, to justify, to interpret, and to back up our conclusions with facts and reasoning.

When we expose students to critical thinking and evaluation, we increase their ability to evaluate themselves and their own performance, which is an important skill set that can help them achieve personal and academic success. Developing self-evaluation skills can also help make external evaluations less stressful, as students realize that their teachers do not have a perfect or objective knowledge of the students' own learning. Self-evaluation helps students gain insight into topics that might otherwise be beyond their grasp; it also helps them not only make decisions, but also take responsibility for those decisions. There are many different ways for students to perform self-evaluations, such as checklists, numerical scales, written overviews of what they think they have learned, interviews, and focus groups. When we engage in peer evaluation and self-evaluation, we need to keep in mind certain basic principles: The evaluation criteria must be consistent with stated goals; evaluation must be part of the learning process; many different methods of evaluation are necessary to gain an accurate and complete picture of progress; and evaluation must always address the learning process as well as the end results. These same basic principles should also be applied by teachers who are evaluating their students' learning. Teachers who are trying to model critical thinking and evaluation for their students should bear the following recommendations in mind:

- Don't just consider arbitrary standards, but also consider a topic's relevance to citizens in a democratic society
- Evaluate group, as well as individual, performance.
- Include a broad range of students' abilities and interests (painting, writing, music, nature, etc.)
- Reward constructive participation and the desire to achieve results, not just the results themselves.
- Make use of self-evaluations, and peer evaluations from other students.
- Encourage cooperative study, positive interdependence, and individual responsibility for learning.

Teachers who are skilled at evaluation and critical thinking help themselves as well as their students, because they can use the feedback of their colleagues and mentors to improve themselves personally and professionally.

Using these skills in my everyday work, I have noticed better cooperation among my students, better performance on their activities, and a better attitude towards taking responsibility for their performance. Students and parents also seem to have a better understanding of the grades I give, and are better at evaluating their own performance and engaging in constructive self-criticism.

***Serafima Bakhareva**, Professional Development Institute for Educators, Novosibirsk, Russia.*

I believe that *experience* is the crucial word to consider here. In the process of evaluation students can acquire important and necessary insights into their learning—but evaluation is most constructive if the experience is positive. Schools evaluate students all the time: their written work, their oral responses, their behavior, their appearance, etc. Students also evaluate themselves and other students. They are always evaluating their own work and the work of others; their own behavior and other people's behavior; various teaching and life situations, etc. — even if nobody is interested in their opinion. By doing so they learn to compare, analyze, assess, and exercise judgment. They learn to understand concepts of better and worse; appropriate and inappropriate; fair and unfair; honest and dishonest. This experience helps them to interpret the marks and grades they receive at school, and understand why they received these grades.

As an elementary school teacher, I want to familiarize children with the process of evaluation, and help them to apply that knowledge productively to support their own learning. Aware of the value of this experience, I constantly seek ways to use it in my classes.

It is interesting and useful for students to observe how several of their classmates perform the same task. It doesn't matter what they are doing—adding numbers, writing words, composing a phrase or a sentence, analyzing the phonetic composition of words. And it doesn't need to take a lot of time.

For example: Five students go to the blackboard and write words in a column When they have finished, they return to their seats, and the results remain on the blackboard. Now everybody has an opportunity to compare and evaluate. Together, we correct mistakes when we see them (sometimes the person who made them sees them first!). Then we analyze which mistakes were repeated, and what needs to be taken into account next time. We look at the writing and assess which is more attractive to look at (neat writing), which is easier to read (legible handwriting), etc.

The work that, from various points of view, is determined to be the best may be left on the blackboard as an example for some time. Sometimes none of the work warrants this honor; and other times it is difficult to choose the best because they are all wonderful! Needless to say, when the process of evaluation is so public, it is crucially important to emphasize that it is the work that is being evaluated, not the students themselves!

You don't need to give definite grades in this case. Children often forget about formal grades and don't even ask, "What did I get for it?" Each student can see his or her own work and assess it; being able to directly compare their work with that of others doing the same task makes this easier and more concrete. And every child can draw his or her own conclusions about how well the work was done. Children are fair by nature, and they often understand much more than we grownups realize.

It is interesting that in such "group" work the evaluation by the teacher and other students practically always coincides with the self-evaluation. When the child realizes that his or her work is being evaluated objectively and fairly, he or she hardly ever takes offence. It is important to make clear both the expectations for the task and the criteria used in evaluation. It is also important that poorly done work be acknowledged as poorly done—and that the student be shown what is needed to improve it. By making evaluation a positive experience, by opening it up and involving students in the evaluative process, we can provide them with invaluable experience that will inform and positively motivate them, and contribute to their learning.

Photos from the authors' archives

***Jun-min Kuo** Assistant Professor of English, Department of Foreign Languages and Literature, Tunghai University, Taiwan.*

My students in Taiwan are all university students, i.e. students who are no longer senior high students and who therefore are studying English for their own enrichment, not just to prepare for standardized testing. This transition, or perhaps I should say "privilege," allows me to assess my students' performance while working from the assumption that there are no "wrong" answers. This belief motivates me to construct comfortable spaces, where students can critically and creatively reflect on various print and/or non-print texts. For example, in the first week of the semester, students are asked to introduce themselves individually both in the classroom and on a weblog. They may work in pairs one week, and perform an original four-minute dialogue in class another week. They may listen to a love song and respond by revising its lyrics into a version of their own that might depict their personal experience. During the second semester, they may perform a group play with six or seven roles, on a topic

How do you ensure that evaluation is a positive experience for you students?

related to their own lives. Sometimes I have students watch a film clip, discuss any topics they can identify in the clip, and relate the topics to real stories that they find in local newspapers. They may also read a poem or a picture book and talk about it. The ideas shown in students' performances mainly come from students themselves and their lives. This ensures that evaluation is a positive, rather than a negative, experience.

Rafael Madoyan, Principal of School 177, Yerevan, Armenia.

***Lyudmila Arushanyan**, National Education Institute, Yerevan, Armenia.*

One of the most difficult pedagogical tasks is to ensure that evaluation exerts a positive influence upon the process of teaching. The cult of high grades, which currently dominates school life, too often results in the situation where students and parents resort to swotting, cheating, and even "making deals" to achieve the desired goal of high grades. In order to change this situation we should work to eliminate the negative aspects of our current approach to evaluation. The following principles provide sound guidance here.

- It is necessary to provide for fair evaluation, both by eliminating the potential for cheating through strict monitoring of exam sessions, and by involving impartial teachers in the composition and conduct of examinations and tests.
- Evaluation tasks should be individualized, and should require students to demonstrate analytical thinking and creative approaches.
- The process of evaluation should be ongoing and should play a formative role. It should be a part of the teaching process, rather than simply the conclusion to it.
- Priority should be given to the acquisition of knowledge and skills, rather than grades or test scores. This emphasis should be clearly communicated to both students and parents.

The achievement of this last goal is not limited to school life, as it involves the values of society as a whole. Numerous external factors, including knowledge requirements for future career success and entrance requirements for institutions of higher learning, reinforce students' obsession with grades. However, the first three points in the list refer to the responsibilities of the school, and it is our conviction that persistent efforts to implement them could have considerable impact. At our school we are taking certain steps in this direction.

When compiling final grades, the school administration gives priority to the scores received on school-wide tests, for which tasks are compiled by computer from an extensive database of questions and answers on all school subjects which is available at the school. Members of the school's board of directors are required to be present during these tests. If teachers want to give a final (semester) grade that differs by one or more score units from a student's results on the school test, they must justify their decision at a teachers' meeting. Unlike the idealists who portray teachers as elevated beings, concerned only with communicating the joys of learning to their students, we believe that a teacher is an ordinary person, whose personal self-interests prevail. Consequently, we attempt to eliminate the potential for lack of objectivity by avoiding, wherever possible, reliance on subjective factors in evaluation.

The teachers' professional skills are crucial to ensure that test tasks correspond to the evaluation goals. We believe that the positive impact of evaluation derives from the incentives it provides for students as they strive for better results on the basis of the objective evaluation of their performance. It is very important that the student be aware of his or her potential, his or her level of skills.

As for the actual methods used by our teachers in this process, we offer the following examples:

- Creation of student task groups charged with designing written tests for future classes. Involvement in such groups helps students gain insight into how they themselves should prepare for such tests. This technique has been used successfully to evaluate students' knowledge of the theoretical issues of physics. Subsequent self-evaluation helps students become aware of inadequacies in their own test preparation strategies.
- Tasks are differentiated according to their difficulty and appropriateness for various grade levels. When students can independently select tasks of a certain difficulty level, it helps them to assess their preparedness and provides an incentive to select a more difficult task at the next test. We have used this effectively with exercises in physics and mathematics.

In Armenia, both reform-minded teachers and education administrators are increasingly aware of the need to make evaluation a positive experience. During the current academic year, a new form of evaluation is being implemented that includes two types of grades: a numerical grade and an evaluative comment. The numerical grade sums up marks awarded over the course of a term or semester, and is used to calculate final grades. The second type of evaluation is to be of a continuous and formative nature, and will be based on performance of oral, written, and practical tasks, including homework assignments. There is no final version of it yet. This initiative is an experimental project of the National Education Institute; our school is involved in developing this approach to evaluation, and our teachers have been asked to find the best methods to implement it. Without providing any details, I would like to cite the following remarkable developments by our teachers:

- The provision of a separate section in the class register for formative evaluation, where teachers can enter their observations and analyses of the student's performance for every subject taught
- The use of a thick logbook for each student that covers every school subject studied. All written work performed in class and at home is recorded in this book, along with the teacher's comments and evaluation of it;
- The compilation of a portfolio for each student;
- The use of a computer grade log for each student, into which the teacher enters all the above mentioned observations and informative evaluations. Password protected Internet access makes it possible for both students and their parents to follow the progress of the student.

The first four months of the experiment have revealed that the effectiveness of these initiatives is more a consequence of the professional qualities and scrupulous work of the teacher than the specific form of teaching favored by that teacher. This kind of work demands considerable time and effort: Individual observations, evaluations, and notes must be made on many students, practically every day. It should be noted that most of our teachers are not accustomed to this way of evaluating their students, and many are not ready for it. Although efficient and effective teaching requires continuous concentration upon the needs of every student, teachers need to realistically take into account their own personality and teaching style when preparing for class work, when conducting class work, and when assessing students' performance. The all-subject student logbook and the computer log seem to be the most practical and feasible of the new tools introduced. The student logbook is always available, parents have access to it, and it provides a clear picture of the work performed and the teacher's comments on that work. It allows for an easy comparison between what students report about their progress and the actual written work they produce; the dynamics of the teaching process are made obvious. As for the computer log, it is a comprehensive database that contains a rich cross-section of information about the student. This log also provides extensive opportunities for teachers to make timely analyses of individual and group results.

In conclusion, we would like to remark that teaching is both a craft and an art. By strategically combining creative approaches, and drawing upon the professional skills and knowledge of teachers, schools can make the evaluation process a much more positive and informative process for all involved—teachers, students, parents, and administrators alike.

Mellinee Lesley

High Stakes Testing and Fourth Grade Readers: Documenting the Impact on Teachers, Children, and Learning

Photo from the author's archive

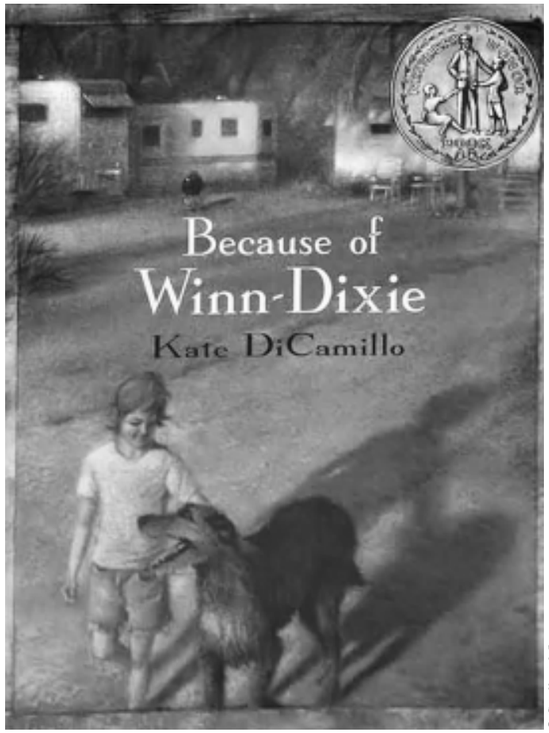
Mellinee Lesley
is Assistant Professor in the language and literacy program at Texas Tech University in Lubbock, Texas, USA.

Seated on the floor in three wiggling lines, Ms. Johnson's class of fourth grade children struggled to pay attention as she read aloud from the book *Because of Winn Dixie*. Clara found it especially hard to sit still, listen to the read-aloud, and keep her hands from poking other students. In an effort to curb Clara's disruptive behavior, Ms. Johnson paused and admonished her for her lack of attention. To this, Clara responded abruptly, "I hate reading because I can't read." Asked if she wanted to learn to read, Clara admitted angrily that she wanted to learn to read but just "didn't know how."

Clara's impatience with Ms. Johnson, and her frustration with her reading ability, is an example of the very essence of the literacy crisis in the United States, which has given rise to accountability mandates that question the quality of teacher preparation and evidence of student achievement. In the setting where I encountered Ms. Johnson's class, standardized assessments are used to measure student achievement and teacher quality for purposes of accountability. Little is being done, however, to foster reflective practice or a sense of inquiry concerning the apathy towards reading experienced by children like Clara. Even worse, locally-derived efforts for professional development have been greatly undermined by standardized accountability mandates.

Braun and Mislevy (2005) suggest that "we need to tell stories about tests—their purposes, their construction, our performances on them" (p. 491). Without such stories, we will cease to refine our intuitive concepts of precisely what we are measuring on a standardized test, when such a test is appropriate for purposes of accountability, what the limits should be for making high stakes decisions from a standardized test score, and what the best ways are for preparing students for such tests. While research on reading assessment is often reported through numerical data, narratives also need to be told that capture elements of the "dailiness" of high stakes reading assessments. Through narrative inquiry (Lyons & LaBoskey, 2002) it may be possible to create a much-needed counter dialogue surrounding high stakes assessment that calls into question intuitively derived, banal, powerless, and misguided approaches to teaching and assessing reading (Bracey, 2003).

In my role as a university researcher, a principal of a Title I elementary school invited me to become a part of the school's fourth and fifth grade professional development reading initiatives, which largely consisted of a weekly book club for the teachers. Title 1 schools receive additional federal funds to address the learning needs of children living in challenging social and economic circumstances; these schools are sometimes described as high poverty/low achievement schools. The fourth grade reading/social studies teacher also invited me into her classroom to assist with struggling readers. In spite of these invitations, our efforts at meaningful collaboration were ultimately overshadowed by the pressures of far-ranging accountability measures predicated on high stakes testing. In this paper, consequently, the narrative I hope to tell is one of a troubled intersection between high stakes testing, fourth grade readers, and locally derived professional development initiatives.



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Methodology for this study

I collected data through participant-observation field notes (Spradley, 1980) gathered during one semester in a fourth grade reading/social studies class. After each day that I worked with students in the setting, I spent at least half an hour debriefing with the classroom teacher, checking on what I had observed, asking questions for clarification, and planning lessons for the following week. I later reconstructed my field notes into vignettes, and developed theoretical assertions about the vignettes based on a broader, grounded theory analysis of my field notes (Harry, Sturges & Klinger, 2005). I also shared three of the vignettes with two literacy educators to serve as a form of peer debriefing (Carspecken, 1996) for further feedback on my interpretation of observed events.

Through a series of five juxtaposed vignettes (Fecho, 2001), I examine my experiences with the ways high stakes testing molded the reading experiences of fourth grade students in a Title I school, in order to gain a broader understanding of reading assessment and accountability. These vignettes present a window into the manner in which children, parents, teachers, and administrators respond to a culture of high stakes standardized testing. Taken collectively, these vignettes consider the resulting effects of mandated assessment that imparts severe consequences for children; is developmentally inappropriate (McGill-Franzen, 1998); is predicated upon an accountability system that few educators and parents are invited to question or thoroughly understand; and is culturally removed.

Setting the stage for narrative inquiry

The school where I encountered the fourth grade children was an urban, Title I school located in the United States, surrounded by modest houses with collapsing chain link fences, some with seasonal decor and toys in their yards. These reminders of the presence of children stood in stark contrast to the growing number of vacant lots, where old businesses and boarded up houses were being methodically demolished to create space for a new freeway. The neighborhood was slowly vanishing, yet the small school bustled with energetic children, an optimistic principal, and several professional development initiatives.

I began working with the school's fourth grade reading/social studies teacher, Ms. Johnson, [pseudonyms are used for all of the names presented in this piece] in September after she approached me concerning problems she was having with teaching reading in her afternoon classes. Although she had over twelve years of teaching experience, and worked quite successfully with her ESL students, Ms. Johnson shared concerns with me about her "regular" students' reading abilities and poor classroom

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behaviors. I volunteered to work with her students during the last two class periods of the day one day a week. When I began the project, I thought I would be helping Ms. Johnson with setting up a guided reading program in her class (Fountas & Pinnell, 1996; Fountas & Pinnell, 2001). I did not foresee that I would also be gaining a front row seat to observe the classroom impact of high stakes reading assessments. Working with children who were new to fourth grade gave me an opportunity to see the behavioral, social, and cognitive outcomes of high stakes third grade reading expectations for this group of children.

Scene I: A child's residual fears of severe consequences for failure

On the first day that I worked with a small group of children in a content-area guided reading lesson, Jon turned the pages of his social studies textbook listlessly. Despite the bright photographs and artfully distributed print, he showed no interest in exploring the text. For a few moments, he glanced over his book, thoughtfully holding the pages between his fingers. This was a rare break in the usual torpid, head-in-hands behavior I had observed when Jon was sitting at his desk. He had already been retained a year in third grade, and loomed much larger than his fourth grade peers. Sensing that he was about to completely disengage from our guided reading group (Fountas & Pinnell, 1996), I asked him to read a few sentences to me aloud from his book. Rubbing his large hands down his face he said, with a wincing expression, "I can't. I can't read. Miss, I hate reading. I don't want to do it."


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Taken aback by his sudden, negative cascade of feelings, I wondered when this child had decided he hated reading. I responded by stating that he *could* read, and that I would read with him. We began reading together. I lowered my voice and let him lead. When he finished a few paragraphs, he stopped and looked at me. "Why do you think you can't read?" I asked him. He shook his head and looked away.

In the months that I observed and worked with Jon I came to understand that his disinterest in reading arose at least in part from his deep-seated fear of failing a grade level again. While this child had been retained a year, he had also been designated a "special education" student, and thus shielded from taking the regular assessment test in third grade. At the beginning of his fourth grade year, however, he had been mainstreamed into regular education, and was no longer entitled to the same testing modification. Ms. Johnson recounted conversations with him in which he came to her privately

to get easier books to read, in order to help him pass the test. Jon wrestled with fears of failure, as well as fears of being taunted by peers for reading the lower-level books that he zipped into the front of his jacket to hide for his walk home. By October of his fourth grade year, he was exhibiting stress and dread as a reader. He had already experienced the brunt of a culture of high stakes testing, felt the stigma of retention, and worried incessantly about not passing the reading test in fourth grade. When Ms. Johnson offered reminders about the upcoming test, Jon often froze and his eyes widened. Fear registered visibly on his face.

Scene II: Assessment that is developmentally inappropriate

In December, I arrived at Ms. Johnson's class with a bag full of books, expecting to work with students in guided reading groups, only to find Ms. Johnson preparing the room for another practice test and my role diminished to that of an observer. When the bell rang, students entered the classroom, briefly protested about taking the test, sharpened their pencils, fidgeted, and slowly turned their attention to the thick packet of papers placed before them. While one of the fourth grade classes dutifully worked on their practice reading test, a girl named Sandra raised her hand. When I reached her desk, she looked up at me and said, "I don't know what this word means." She was pointing to the word *advanced* in the first answer of the four-part multiple-choice selections. I read the question silently, "What can the reader tell about the Aztecs by reading this passage?" and looked over the four possible answers. Immediately realizing that the correct answer hinged on the very word that Sandra was uncertain about, I asked Sandra if she understood the question. She said, "Yes." I asked her if she understood the other choices. She again replied, "Yes."

"So, do you think any of these choices are the right answer?"

Sandra responded, "No."

"So," I began, "if you know these other three choices are not the correct answer, then what do you think the right answer might be?"


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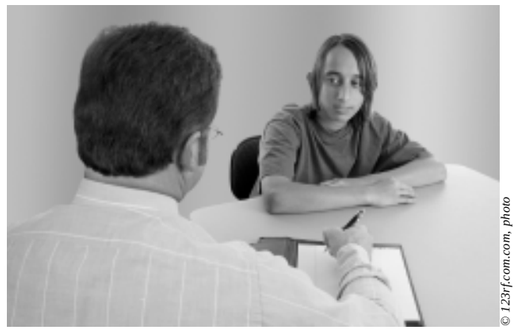
Sandra looked up at me blankly and said, "But, I don't know what this word means."

Sandra couldn't move beyond the fact that she did not understand the word *advanced*. As a fourth grade child, she was still developing in her ability to reason and think abstractly. She had not learned how to deduce answers from a logical process of elimination. In effect, she did not know how to use test-taking strategies to "out-smart" the test makers. Graves (2002) notes that such test-taking strategies are incongruent with good reading practices. As I watched Sandra, a diligent student, become frustrated over the question, I wondered exactly what the test was trying to measure: Sandra's knowledge of vocabulary? Sandra's ability to make inferences in reading? Sandra's ability to make logical deductions on a four-part multiple-choice test?

Scene III: An accountability system that few educators question

Teachers who are required to teach with standardized reading programs often find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themselves locked into methods that undermine their professional knowledge base and their understanding of their students' literacy development (Moustafa & Land, 2002). The same day that Sandra was struggling through a preparation test in her fourth grade reading class, Amy gloomily looked down at the first reading passage on the test before her and began to stare blankly ahead into space. I crouched next to her and asked, "What's going on?"

Amy grinned at me shyly and said, "I can't do it. I can't read."

"I've heard you read; you're a good reader. Come on, start here," I coaxed pointing to the title of the passage. Amy began to read softly to herself. I nodded at her and moved away from her desk. A few minutes later Ms. Johnson announced to the class that no one was allowed to read out-loud because on the real test they would not be allowed to read out-loud. About six children in the class were reading out-loud. A couple groaned and protested that they had to read out-loud. I looked over at Amy who had stopped reading and was once again staring straight ahead.

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At the end of the day, Ms. Johnson stated regretfully that she had to force her students to read silently because "that's what would be required on the [test]." She seemed frustrated with this decision. When I suggested that these students needed to subvocalize (Wright, Sherman & Jones, 2004) what they were reading in order to engage in self-monitoring for comprehension, she nodded silently with resignation.

Ms. Johnson later told me that two children out of eighteen had passed this practice test. I couldn't help wondering if more students in the class would have done so had they simply been permitted to subvocalize. How valid is a test if it puts forth expectations that are not developmentally attuned to children's reading processes? Who should be held accountable for the procedural expectations surrounding high stakes testing?

As this vignette demonstrates, children's needs as readers have become secondary to the test, and teachers such as Ms. Johnson feel powerless to advocate for their students. The procedures for administering the test took precedence over Amy's sense of autonomy as a reader. Without a professional development outlet for inquiry, even procedural issues such as this remain unexamined. As the next vignette illustrates, parents' roles as advocates for their children also have been greatly usurped by the culture of high stakes testing.

Scene IV: An accountability system few parents are invited to question

One afternoon in November, I saw Ernie's mother marching down the hall with a scowl on her face. Ernie sheepishly followed closely behind. I thought of the times that Ernie had bragged to me in our guided reading group that his mother was going to move his family away from this "bad" school, and that she had visited an elementary school in one of the suburban school districts with shiny, new corridors and high test scores to match the escalating neighborhood property values. "My mom wants us to move," Ernie stated one day, explaining, "she wants me to go to a good school, so I can learn better."

Ernie's mom had a growing reputation through the school for being a demanding parent. This status didn't garner her much respect: Her requests and complaints were met with retorts about Ernie's poor behavior and subsequent low achievement in school. After the first six weeks in school she had demanded a meeting with Ms. Johnson to discuss Ernie's poor grades. Ms. Johnson responded to Ernie's mother's questions with an invitation to come to class and observe her son's intractable behavior during reading. The day I saw Ernie's mother moving through the corridor with utter exasperation, she struck me as being very isolated from the school's curriculum. Ernie's teacher responded to his statements about moving to a better school with cautionary tales of how much more difficult the reading curriculum was in those "good" schools. The implications were that Ernie would be lost, that his mother's plans were empty threats, and that a new school could not provide any reprieve from his struggles with reading.

Phillips (2003) writes of the need for parents to "continue discussions with teachers, school officials, and senior school district administrators regarding the impact of high stakes testing on children, teachers, and their learning environment" (p. 676). What happens when such dialogues are thwarted by legislative mandates? What lessons are we teaching children about self-efficacy when vocal parents with legitimate concerns are not effective advocates for their children? When children bear the brunt of accountability mandates, parents are often the silent brokers who see the impact of test anxiety (McCabe, 2003: Triplett & Barksdale, 2005), but who have little control over the situation other than to help their children complete practice test worksheets as an evening homework ritual. In fact, as the following vignette demonstrates, a high stakes testing culture can create greater distance between children's home experiences and school expectations for learning.

Scene V: The cultural chasm of standardized reading programs

During the school's Safety Awareness Week, the classroom teacher asked me to

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teach my guided reading groups a lesson on safety from the district's required materials. I began by discussing with the students what they knew about safety, and asked them to think of safety rules, or things they could do to keep themselves safe. Naively, I anticipated responses about wearing seat belts, following traffic signs, or wearing a helmet when riding a bike. These were the types of procedures advised in the reading material. Instead, students talked about avoiding a certain "dirty old perv" in their neighborhood who, according to one of my reading groups, was a "known rapist." Each group also talked about not taking drugs and not possessing guns.

After a discussion over how to be safe based on students' experiential knowledge about their neighborhoods, I passed out the booklets we were to read. We looked at the cover of the booklet, which had a drawing of a girl on a bicycle using a hand signal to indicate which direction she planned to turn in order to communicate with passing cars. We talked about

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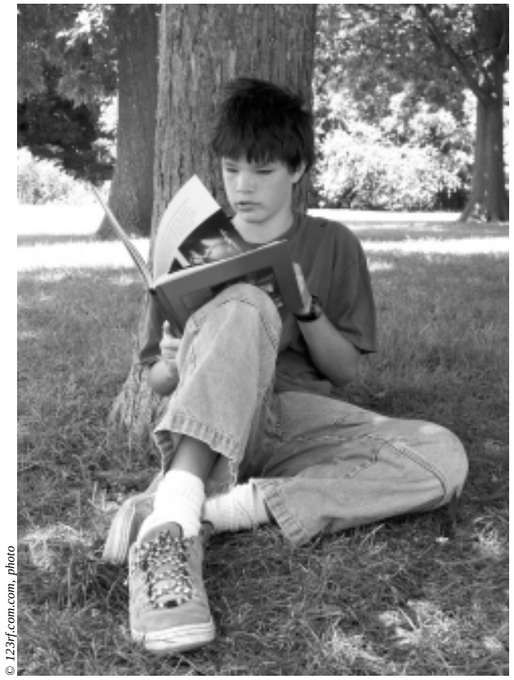

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the picture and considered what was going on in it. In my first group, the students were immediately able to discern the meaning of the picture, but then one student commented that he wanted to get a bicycle for his birthday. Through the ensuing discussion between the children, I realized that very few of them had access to bicycles. Nonetheless, they all knew the worksheet format, and the "school knowledge" expectations for reading about safety rules surrounding bicycle riding.

After our preliminary conversation, I asked everyone in our group to read the booklet. The students obliged, and began their collective rumble of reading aloud. I thought about the level at which these children were capable of code-switching between school knowledge and neighborhood knowledge, and about how these two discourses blended when students wrote about the importance of *not* smoking, *not* doing drugs, *not* drinking alcohol, and *not* possessing guns. Unfortunately, the wisdom formed through the life experiences of these students could never be fully accounted for in the required school curriculum. Reading material devoid of personal relevance does not support the needs of "struggling" readers. Much like the reading encountered on standardized tests, this type of material constitutes little more than school-required nonsense. The further alienated from school forms of reading these children become, the greater their likelihood of experiencing failure as readers (Mahiri, 2003).

Further inquiry into high stakes reading testing: The bigger picture

These glimpses into fourth grade reading pedagogy point to the obstacles that mandatory high stakes standardized testing creates for students, teachers, administrators, parents, and literacy researchers. At this school, high stakes tests and their attendant curricula created barriers to the inquiry-oriented reading initiatives that the book club and my collaboration with Ms. Johnson attempted. Because of this phenomenon, Ms. Johnson and I forfeited information from reading assessments, such as the running records I administered, that reflected developmentally appropriate classroom instruction. As a result, we failed to capture a portrait of each child as a reader through assessment that examines children's performances on more pedagogically minded forms of literacy assessment. Ms. Johnson found it virtually impossible to make room in her curriculum for teacher-made, classroom assessments. Similarly, there were no school-wide performance-based assessments with benchmarks created by grade level teams of teachers. Assessment predicated on inquiry (Serafini, 2001), that would directly support effective classroom instruction, became increasingly rare as the dates of the reading tests approached. Eventually my role, as someone who could work with students in guided reading, administer running records, and consult with teachers about texts, became obsolete.

By placing increasing emphasis on standardized, four-part multiple-choice forms of assessment with these students, we were unable to take into consideration their individual developmental needs, and literacy pedagogy was reduced to the learning of "testable," school-specific knowledge. Finally, with the threat of retention permeating the school, we inculcated fear and apathy responses around reading, which led to increased behavioral problems and an increased likelihood of trauma associated with reading (Hoffman, Assaf & Paris, 2001; Triplett & Barksdale, 2005).

With so many children and teachers caught up in standardized curricular and assessment systems, accountability in reading through standardized means does little to foster reflective practice. Pinnell (2006) states, "The true goal of assessment is accomplished every day in schools in which teachers systematically use assessment to inform their teaching" (p. 80). Within accountability systems, teachers, parents, students, and teacher educators need a vehicle with which to examine questions such as those that my experience raised for me.

Without an inquiry-oriented approach to assessment, we cannot attend to Farr's (1993) recommendations of a demand for valid reading measures, a broader range of assessments, and a description of the value of assessments for various audiences. We also compromise the potential for collaboration between teachers and researchers, and render meaningless locally-derived professional development efforts such as the book club. Sadly, in the end, it is children like those in Ms. Johnson's classes, caught in the struggle to uphold policy makers' views of literacy accountability—often in contradiction to their own needs—who pay the highest price.

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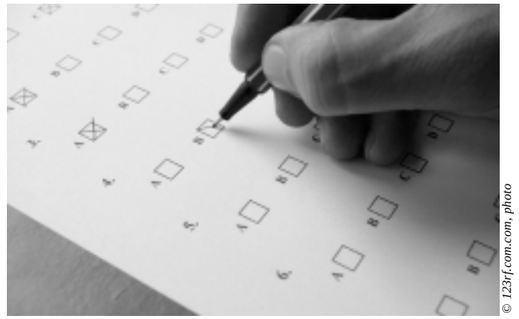

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Yury Vasiliev and Eugenia Rakayeva

Teacher Trainers' Secrets: How to Evaluate a Workshop and Prepare a Trainer's Report

Photos from the authors' archives

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On the importance of evaluating quality

At present, adult education is gaining recognition and garnering interest as a field of education. This is true, first and foremost, for the teaching profession itself. In Kyrgyzstan, teachers have an opportunity to update their professional training by participating in workshops and training sessions on various educational programs, among which the RWCT program (Reading and Writing for Critical Thinking) holds a special place. Its popularity remains undiminished even now, ten years after its introduction, and every year more and more teachers express the desire to attend RWCT workshops. We can attribute this ongoing demand, in particular, to the fact that RWCT trainers always rely on the principles of interactive teaching, and help trainees actually to experience the ideas and values of progressive pedagogy by providing practical opportunities for them to try out all of the new teaching methods and techniques. A highly qualified national team of trainers has been established in this country.

When activities in any field expand, and become a large-scale enterprise, the question of evaluation of quality tends to become especially acute. In our case, the quality of our training is measured by the depth of understanding of the new approaches that workshop participants take back to their schools, and by their capacity to promote the new ideas and implement them in their own contexts. Trainers bear responsibility for all these things.

We should note that quality evaluation of a training workshop is a complicated and multidimensional process. Therefore, we will take a risk here and focus on only one of its components: the quality evaluation of one particular workshop module, and the creation of a trainer's report on this module.

Obviously it is necessary to plan the goals and forms of evaluation in advance (Chikurov, 2001). These need to be simple and clear to everyone, but at the same time they should provide as much information on the achievements and results as possible. In addition, they should correlate with the goals and objectives of the workshop as a whole, and provide the information necessary to compare predicted results with actual outcomes.

Problems in conducting evaluations

The two authors of this article have been working together as a trainers' team for a number of years, delivering RWCT workshops for teachers. In the course of this work, we applied various methods to evaluate the quality of our workshops, processed the results, and drew conclusions. At some point, we began to notice that our own judgments about what had worked successfully were not always

supported by the subsequent practices of our participants. For example, although at the end of a workshop we felt that our trainees were achieving good results in formulating questions in accordance with Benjamin Bloom's taxonomy (Bloom, 1956), our analysis of the lessons we visited subsequently showed that these teachers still experienced considerable difficulties with questioning students "a la Bloom." This finding was quite unexpected, as our positive evaluation of the workshop outcomes was based on procedures recommended by renowned experts, people with enormous practical experience (Kibardina & Alexeyeva, 2001; Chikurov, 2001; Soldatova, Shaigerova, & Sharova, 2000). This contradiction became a source of concern in our work as trainers, and we had to resolve it. We decided to go about this collaboratively, with our colleagues.

Evaluation of quality: Collective reflections

It has become a valued tradition of the national RWCT trainer team in Kyrgyzstan that members get together from time to time to share their experiences, exchange ideas, and discuss hot topics. For such meetings, trainers usually prepare model lessons to demonstrate interactively a particular area of expertise that they would like to share with colleagues. At one point we offered a master class called *Teacher Trainers' Secrets*: *How to Evaluate a Workshop and Prepare a Trainer's Report*. When conceiving this work, we set the following goals for ourselves:

- to present some of the methods that we use for evaluating the quality of a workshop;
- to evaluate the potential advantages and drawbacks of the suggested methods;
- to consider and evaluate our current practices for preparing a trainer's report.

A brief description of our master class follows.

First, we asked the participants to respond to the following question: *What methods for evaluating the quality of training workshops do you know and use in your practice as a trainer?*

Next, participants were divided into teams, and each team chose one method from a list of strategies for evaluating workshop quality. The teams were asked to

- discuss the suggested method of evaluation;
- point out its advantages and drawbacks;
- answer the question: *How can the data received through such evaluation be used in compiling a trainer's final report?*
- prepare a flip-chart presentation.

Brainstorming helped participants not only to recollect approaches to evaluation with which they were familiar, but also, to a certain extent, to develop common terminology for describing methods of evaluation. As they had come to know these methods from different sources, trainers frequently used different terms for the same evaluation techniques (e.g., what some called a *criteria evaluation*, others referred to as an *evaluation chart*).

Photo from Y. Vasiliev's archive

We then divided all participants into five teams, with six people on each team. For this step in the process we had prepared cards with the description of the most common methods for evaluating the quality of workshops (practically all of which were mentioned by our colleagues during the brainstorming). These methods were:

1. *Differentiate and evaluate.* Participants point out the most valuable things they did or learned during a workshop, ask questions, and provide their comments.
2. *Free write.* Participants write an essay about the work done.
3. *My face after the workshop.* Results of a workshop are evaluated by diagrams of facial expressions ("smiley faces").
4. *Criteria evaluation.* A chart with specified criteria is filled out.
5. *The achievements coat of arms.* Each participant creates his or her own "coat of arms" indicating various aspects of personal achievement resulting from the workshop.
6. *K-W-L.* Evaluation is carried out with the help of the formula: Know–Want to Know–Learned (Ogle, 1986).
7. *Analysis of workshop products.* Evaluation is carried out on the basis of the materials created by participants during the sessions, such as models, tables, crafts, photos, etc.
8. *Blitz-interview.* Participants prepare brief summaries of the workshop in two or three sentences.
9. *Letter.* Each participant writes a letter to him- or herself (or a friend, a colleague, future generations, etc.) outlining the most significant results of the training session.
10. *Positives/Negatives/Possibilities.* A large three-column table identifies positive and negative moments and outcomes of the workshop, as well as ideas for improving future workshops. The table is a collective product of all participants.
11. *Feedback circle.* Participants orally state their opinions of the workshop.
12. *Self-portrait.* Participants draw themselves before and after the workshop; the "gallery" is displayed.

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A representative from each team drew out one of the cards, thus choosing a task for the team. For 20 minutes, each team discussed features, advantages, and drawbacks of their selected type of evaluation. The discussions were quite lively; we confirmed that the problem of evaluation was genuinely important to many of our colleagues, and it seemed to us that everyone was grateful for the opportunity to talk about this hot topic. After their discussions, the teams spent seven to ten minutes preparing a flip chart and an oral presentation.

Each team had three minutes to present their results. In each case, these presentations developed into a general discussion. The audience noted any points that, in their opinion, had been neglected by the presenters. Discussions were animated, and facilitators had to direct the stream of questions to ensure that everyone stayed focused on the main theme.

Table 1 on p. 32–33 presents descriptions of the evaluation methods chosen by the teams, and some comments made by our colleagues.

Recommendations derived from reflection

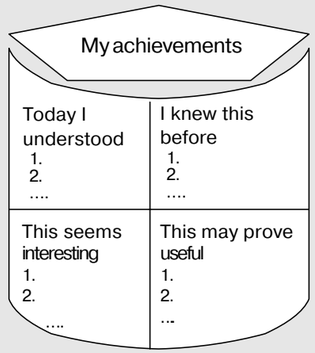
What has this teamwork given us? The responses we obtained from our colleagues—RWCT trainers—revealed a serious problem: When choosing a technique to evaluate a workshop, the trainers on our national team did not typically give consideration to the potential of the method selected, its advantages and drawbacks. Many of us had not given serious thought to which methods might be most effective in this or that case, and as a result, we often failed to get the information we needed.

At the end of this part of our master class, participants came to some important

Table 1 **Methods of evaluation**

Method	Advantages	Disadvantages	What can be used for a trainer's report
Free write Participants are asked to write (individually) an essay focused on the following: • *What impression has today's work made on you?* • *What feelings and emotions has it caused?* • *What has it made you reflect on?* • *Which moments did you especially like or dislike?* The facilitator can read these essays and make a brief summary for the audience, or just "publish" them the next day (paste them on the walls and invite participants to browse through them). Then the group may undertake a "reflection about the reflections." Participants can be invited to discuss the essays, to share their impressions, to highlight especially important and valuable moments, and to agree or disagree with the authors.	• Provides broad information • Enables summarization of results • Many people are better able to express themselves in a written statement rather than in an oral one	• Quite time-consuming · Evaluation is subjective • It is difficult to process and analyze the written texts • Responses can get "off topic" and deviate from the desired focus (on the specific aspects of the session being evaluated)	• The ideas offered by the participants can be subdivided and categorized. • The content and ideas expressed in these free writes help the trainers trace the professional and personal growth of participants.
My face after various stages of the workshop Each participant chooses a "face" from a set with a range of expressions to indicate his or her reaction. The facilitators interpret them the choices, and comment on the results.  • It was a success today!  • This makes me think. • It is hard to agree  • I disagree • I reject this.	• The opportunity to receive an emotional response • Openness of statements • Removes stress · Switches on imagination • Saves time	• Responses are over-simplified. • The text accompanying the faces narrows the responses to purely emotional ones	• "Live" individual emotions and reactions
Criteria evaluation Participants are given a table with specified criteria. Their task is to evaluate each one according to a five-point scale, marking their choice with a "+". Criteria are designed to be relevant to the workshop content, goals, and problems. For example: **Criterion** / **Evaluation**: 1 2 3 4 5 Structure and organization of the workshop Alignment of the workshop content with your expectations The extent to which the knowledge gained at the workshop is applicable to your work	• Completeness and scope of information • Transparency, openness • Permits facilitators to obtain information on specific aspects of the workshop	• It is difficult to choose the criteria precisely reflecting the theme of the workshop • Much time is needed to process and analyze the data • Calculations are complicated • There is no chance for creativity, as the criteria define the focus • Participants do not have a chance to point out things not addressed by the criteria offered	• Precise quantitative data • Opportunity for graphic interpretation of results • Opportunity for developing research in a predetermined direction

Table 1 **Methods of evaluation**

Method	Advantages	Disadvantages	What can be used for a trainer's report
The achievements coat of arms Evaluation of a workshop can be carried out by asking each participant to create a coat of arms featuring his or her individual achievements (see Fig.1). Once participants have completed these coats of arms, they turn them in to the workshop facilitators for analysis. When the analysis is finished, the coats of arms may be displayed for everyone to see. As visual representations of participants' self-evaluations, they provide facilitators with a lot of valuable information, both about participants' achievements, and about the effectiveness of their own work. 	• Participants' comprehension of the workshop material gets structured. They realize what they have achieved. • Facilitators get an idea of whether the workshop material has been successfully mastered • Potential for classroom application of the knowledge and skills obtained by participants becomes clearer	• No provision for trainers to ask questions of the participants • Does not reveal problems and difficulties experienced by particular participants	• The data on the level of comprehension of workshop materials by participants • The data on growth of professional skills
Feedback circle Participants stand or sit together in a circle and express their opinions about the workshop. Feedback may take the form of responses to facilitator's questions; free speech; answers to questions that have been distributed in advance; or role playing (*If I were a trainer… If I observed this workshop from the sidelines… As a workshop participant, I would say…*, etc.)	• Variety of responses • Opportunity to hear everyone • All participants have an equal chance to express their ideas • Gives facilitators a clear understanding of how participants perceive the workshop	• Time-consuming to implement • Difficult to record and analyze all of the participants' valuable ideas • Participants may refrain from frank answers, as anonymity is not ensured	Lots of information • Possible directions for further work at the workshop • "Live" statements of participants

conclusions that we later formulated as recommendations:

1. Evaluate in advance the potential advantages and drawbacks of the methods that you might use to assess the quality of the workshop. This will create a "bank" of evaluation methods, which can be drawn upon in the future.
2. Choose an evaluation method that best corresponds to the content and goals of your workshop, and most importantly, that gives you the information you need.
3. From time to time, carry out an inventory of your "bank." It may open up new potential applications of the methods you are using.

Reporting your work

In most cases, upon completion of a workshop, trainers prepare a report for the organization for which they work. In Kyrgyzstan, the Laboratory of Critical Thinking in the American University in Central Asia coordinates the work of all RWCT trainers. Rigid requirements have not been set for

Photo from V. Mariko's archive

workshop reports, but our own experience has shown us that we need to structure these reports in a more orderly way, and make them more informative, so that the reports provide a more complete picture of the quality of the session and of the professional level of the trainer. The value of the report is dependent upon the quality of the information gathered from the workshop participants. Thus, the second part of our master class, a logical follow-up to the first part, was a discussion of how to prepare a trainer's report using evaluation data.

The reporting model we offered for discussion originated from ideas we had developed at one of the trainers' meetings. We wanted to receive feedback from our colleagues about this reporting model, and we also wanted to contribute to the improvement of our colleagues' reports.

First, we suggested that they read the following recommendations on "How to write a report on the workshop you conducted," and that they respond by using the INSERT method.

How to write a report on the workshop you conducted

A trainer's report should reflect all the data necessary to make a conclusion about the event itself, about the trainer's work, the reactions of participants, etc. Thus, it is expedient to develop the report according to the criteria in Table 2.

As always, the collective discussion helped us look at our own achievements from a new perspective. Our colleagues shared their opinions and comments on the suggested report model. Below are those that seemed to us most important:

- *It is probably necessary to add a separate item to this list of recommendations that would address trainers' self-evaluation during the workshop.*
- *It may be a viable idea to clarify some points, in order to avoid duplication and possible ambiguity—for example, to clarify the distinction between "Participants' reaction to the workshop" and "Participants' evaluation of the workshop."*
- *It makes sense to include an evaluation of what changed in participants' behavior during the workshop (according to the trainer's opinion), and whether there seem to have been any shifts in their thinking and general outlook.*

Photo from V. Mariko's archive

What did our colleagues' comments show? On the whole, our recommendations for drawing up the report were considered to be an effective trainer's tool, but a tool that demands further "sharpening" in terms of making the points more precise. One more

Table 2 **Criteria for a trainer's report**

	Report criterion	Rationale for applying the criterion
1	***Organization*** (where and when the workshop took place, who participated in it)	To get a general idea of the workshop, it is necessary to know the date and place, the number of participants and their professional roles, the content areas in which they work, and the workshop's premises and conditions.
2	***Workshop equipment*** (logistics, handouts, meals, etc.)	To judge the facilitators' theoretical and practical preparation for the workshop, and whether they take their duties seriously.
3	***Content*** (strategy, methods, activity)	The focus, structure, and content of the workshop become evident, as well as the distribution of time and work.
4	***Participants' reaction to the workshop*** (how they reacted to new ideas, what changed for them as a result of the workshop, etc.)	Mainly to reveal the personal growth of participants; it attempts to determine whether they are able to compare their new experience with previously held beliefs, and whether their traditional viewpoints were challenged; and it provides insight into the psychological climate of the workshop.
5	***Successes and achievements*** (what participants have achieved, what new level they have reached, what new knowledge and skills they have obtained, and similarly, how the trainers have improved and grown)	Makes it possible to determine whether the workshop goals have been achieved; it reveals changes in participants; it helps in planning ways to further motivate participants; and it enables facilitators to carry out self-evaluation and to adjust plans for future sessions.
6	***Creativity*** (whether new or unexpected elements are evident in the work of both participants and the trainer)	Reveals the influence of new ideas on the overall performance of both facilitators and participants; indicates the importance/impact of the new ideas presented.
7	***Problems, difficulties, drawbacks*** (what has caused difficulties, what turned out to be a failure, what was unclear, what was lacking, etc.)	Analyzes difficulties and reveals misunderstandings; indicates where changes to workshop process and content are necessary. Such analysis makes evident the level of self-evaluation among trainers, the trainers-to-be who help them, and the participants, and allows for tracking of the steps taken to resolve the problems.
8	***Conclusions and recommendations for the future*** (what needs to be changed, excluded, added, improved, continued, etc.)	Reveals what facilitators do, and need to do, in terms of improving their work; helps monitor whether participants' wishes and suggestions have been taken into account, whether the trainer and participants have deviated from the preplanned goals, what the positive trends have been, and what plans are in place to continue them.
9	***Participants' evaluation of the workshop*** (evaluative questionnaires, responses, recommendations, etc.)	Provides feedback, shows the reaction to facilitator's work and the methods chosen. For trainers such questionnaires and responses can serve as self-evaluation tools, while their ability to analyze and constructively respond to the data obtained gives indications about their professional qualities and about their ability to judge their own effectiveness.
10	***Materials*** (texts, handouts, copies of methodological literature, lists of participants, photos, videos, the workshop program, essays, etc.)	Materials from the workshop reflect the scope of the work undertaken by the trainers, and speak about their systematic approach, competence, and professional qualities. The supporting materials provide visible evidence of the workshop's orientation and its concrete outcomes.

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evaluating quality. Thus, by means of this master class we not only achieved the goals we had set for ourselves, but also gained a powerful impetus to work on this issue further.

In summing this all up, we want to note that we do not regard our ideas as unique. However, we hope that the experience described here may help our colleagues reflect on how to evaluate the quality of their workshops more effectively. We see this as a sound step towards increasing the efficiency and impact of the work that trainers do.

obvious conclusion is that, as trainers, we need to learn to observe participants attentively during the workshop, to analyze changes in their behavior (which can reflect changes in thinking and outlook), to interpret these observed changes competently and cautiously, and also to evaluate our own work deeply and comprehensively.

At the end of our master class our colleagues, the national RWCT trainers, expressed the opinion that, in addition to certain direct practical results (for example, help in how to evaluate a workshop and compile a trainer's report), the discussion of these issues enabled all of us to reconsider the potential value of trainers' reflections on

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Chun Ming Eric Chan

Mathematical Modeling Experiences for Mathematical Development in Children

Photo from the author's archive

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Introduction

Mathematical process components such as *mathematical reasoning, communications and making connections*, and *application and modeling* have just been introduced into the Singapore Mathematics Curriculum Framework (SMCF). The revised curriculum now recommends that the development of, and engagement in, these processes be "part of the learning at all levels" (MOE, 2007, p. 14), including primary school. This move cannot be considered merely a minor revision, because enacting the intended curriculum requires pedagogical approaches that contrast sharply with traditional teaching. For children to be able to reason and communicate their mathematical ideas, to make connections, and even to develop representational models conceptually and mathematically, will require the promotion of appropriate classroom conditions for these processes to take place in a constructive manner.

Our local mathematics classroom practice has bordered on the traditional, with a strong emphasis on the development of concepts and mastery of skills through regular practice and testing (Chang, Kaur, Koay, & Lee, 2001), and is predominantly teacher-centered (Ho, 2006). Such pedagogic approaches serve to enable the development of procedural knowledge used in solving problems with definite answers. They have also enabled our students to perform very well in international assessment studies, such as the Trends in International Mathematics and Science Studies (TIMSS), where our students have emerged as the top scorers in 1995, 1999 and 2003. Although the strong achievement results offer confirmation that sound structures are in place for developing good problem-solving skills, the question is whether our students are able to do mathematics beyond what is taught in the mathematics classroom. We are not able to ascertain whether our students can transfer their curricular mathematics knowledge and apply it in real- or near-real-world situations, because our younger students have not experienced a realistic mathematics education (RME) type of curriculum. Nor have they participated in assessment studies that utilize applied math items, such as the Program for International Student Assessment (PISA). This latest move to revise the curriculum in Singapore is considered timely and consistent with ongoing reform efforts worldwide to make mathematical problem solving meaningful and authentic, as well as to empower teachers to take on more process-based approaches.

In an effort to determine how young learners would respond to newer pedagogic approaches, I have designed several model-eliciting activities for small collaborative groups of pupils. I adopted a problem-based learning (PBL) approach, because the model-eliciting tasks were in many ways characteristic of the type of tasks suitable for PBL settings. Such tasks are complex; authentic; able to trigger critical and metacognitive thinking; and require iterative processes and decision-making moments (Tan, 2003; Uden & Beaumont, 2006). The complexity of the task provides a context for argumentation and collaboration. The teacher

functions as a facilitative coach available to provide scaffolding at certain junctures of the modeling process (Ho, 2004). According to Tan (2007), these key features of the PBL approach provide a learning environment where cognitive immersion takes place. Reform efforts in the field of mathematics education also advocate the use of problem-based approaches to facilitate better learning and more authentic problem solving (Erickson, 1999; Hiebert et al., 1996). I had the opportunity to video-record the various mathematical modeling sessions that resulted from my PBL activities, and in this article I share excerpts from the pupils' interactions to illustrate the value of such activities in children's mathematical development.

Mathematical modeling activities

Solving word problems that involve the direct mapping of the structure of the problem situation onto the structure of a symbolic expression is considered traditional mathematical modeling (English, 2003). It is limited in terms of both opportunities for interpretation and solution generation. More recent conceptions of mathematical modeling see mathematics as a set of abstract formal structures, a way of making sense of the physical and social world (Greer, 1997). Authentic contexts, where children can situate their reasoning in solving real-world problems, are viewed as the platforms for sense-making; and mathematical modeling activities are a way of eliciting the children's mathematical thinking and model conceptualizations. In mathematical modeling, the starting point is a real-world problem or situation, and the process is one of representing such problems in mathematical terms in an attempt to find solutions (Ang, 2001). The process is characterized by an interplay of interpretation, formulation, and refinement of models towards real-world solutions, which are generalizable and reusable, in the sense that they can be adapted whenever similar problem conditions are imposed. For example, the teacher could present students with a real-life problem of a neighborhood that is dissatisfied with the local bus service and challenge them to plan a more effective bus route and schedule for the residents. The students would be expected to investigate the situation; work with quantitative or qualitative information to propose amended time schedules and a more efficient route; and justify their suggestions. Such an endeavor does not allow for a linear problem-solving process. Rather, it's a task that requires students to frequently revisit the problem situation, continually reframe their understanding of the situation, and refine their conceptual representations until they are satisfied that they have obtained the optimal solution: a model representing a workable and improved bus route and time schedule.

Engaging children in mathematical modeling activities therefore provides them with opportunities to work in authentic problem situations, where they can explore, inquire, infer, critique, initiate ideas, and generate multiple interpretations and solutions. In so doing, they undergo an iterative process in coming to terms with their interpretations, descriptions, hypotheses, generalizations, and justifications (Doerr and English, 2003). They are also learning socially through their interactions. In a sense, involving children in mathematical modeling activities supports mathematical development in ways that traditional teaching and learning approaches do not. Traditional approaches limit mathematical thinking, using problem tasks that fail to adequately address the mathematical knowledge processes, representational fluency, and social skills needed for the 21st century (English, 2003).

Background details

As part of a study related to mathematical problem solving that I am currently pursuing, two classes of grade 6 pupils were engaged in a series of five model-eliciting activities The pupils and their mathematics teacher had not been involved in mathematical modeling tasks prior to this study. Before the first modeling session, the mathematics teacher was given access to, and was briefed on, the tasks and plausible solutions. She and I together worked through what is entailed in the process of facilitating in a PBL setting, and she was briefed and given literature to read about scaffolding roles. Before the sessions, the pupils were provided with some training on thinking aloud, on exercising "10-inch voices" to ensure audibility (without the need to shout or speak loudly, since the group members would be working physically close together), and on helping behaviors (acknowledgement, affirmation, proactiveness, interdependence, mutual accountability, etc.). My goal during this time with the pupils was to get acquainted with them, to orientate them to the model-eliciting tasks, and to reduce their consciousness of the researcher and the video equipment.

The model-eliciting task: The hiring problem

In this article, I share excerpts of pupils' engagement in a model-eliciting task, *The Hiring Problem*, shown in Figures 1a and 1b. This was the fifth in the series of modeling activities that the pupils engaged in. Students were provided with data about cleaning, painting, and moving services, and their task was to hire workers to renovate the school within certain given constraints. In developing the model, the pupils were expected to determine the most cost-effective way to hire the workers by using different combinations of workers within a day, within services, and across services for different days. They needed to compare productivity indices to make informed hiring decisions that provided value-for-money.

How mathematical modeling invites mathematical development

The excerpts here, selected from the interactions among a group of five pupils from a high-ability class, highlight elements likely to support mathematical development. These elements show the pupils' situating their thinking and reasoning at different junctures of the modeling process. Throughout, the process was not linear. Students tested and revised the interpretations of the given data and their own hypotheses. My interpretations of the excerpts suggest the value of having such model-eliciting activities in the mathematics classroom. The interpretations of the excerpts are based on a social learning perspective, where the protocols

Figure 1a **The Hiring Problem Scenario**

Mission	Your group is in charge of hiring some workers to help clean, paint, and move furniture in the school. These workers must complete the job within **4 days**.
Conditions	1. You can hire only from **one** company **once**, and you have to accept all the workers for that company. 2. You have a Worksite Supervisor who can only supervise **at most 12 workers per day**, so you try to hire as many as 12 per day. Assume that each worker to be hired works the same amount of time, and produces the same amount of work per hour. 3. You need at least: 14 workers for moving furniture, 14 workers for painting, and 14 workers for cleaning within the 4 days.
Presentation	You have to present your case to your class. Show in full detail (with different solution options) how you arrive at hiring the workers. Show your **productivity index and use it to make your decision**.

Productivity index is calculated at the end as follows:
(Total No. of workers Total cost) x 100 {give index to 3 decimal places}
Productivity index is for you to determine if you are getting value for money. The larger the index, the better.

Figure 1b **The Hiring Problem Data Sheet**

Company	No. of workers	Cost ($)
Cleaning Services		
A	4	160
B	2	76
S	6	270
D	3	120
E	5	175
Painting Services (Paints Provided)		
F	3	114
G	6	240
H	7	315
R	4	160
J	5	210
Moving Services		
K	7	245
L	4	160
Q	3	135
N	6	228
T	4	140

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are taken mainly as reflecting collective ways of reasoning.

Identification of goals and variables

At the start of the activity, pupils were given the two task sheets (Figures 1a and 1b). They briefly read through them and discussed what they perceived to be their goals for the task.

S4. *We have to find the perfect combination.*
S5. *We also need to find the productivity index.*
S1. *You only get as much as you pay for.*
S3. *Not necessarily. It depends on costs and the number of workers. So our group is in charge of some workers to clean, paint, and move furniture in the school. But they must complete the job within 4 days* (paraphrasing the task requirements from the task sheet).

It is evident from the excerpt that they were quick to think about both the process and the product. Implied in S4's point about finding the perfect combination is the recognition that there would be other less efficient combinations, and that their goal was to obtain the most efficient combination. S5 pointed out that they needed to calculate the productivity index (PI), as recommended in the task sheet. This was not all. In their written goal statement, they were clear that they needed to "hire at least 14 workers from each service within the least possible time, for the least possible cost." From this, as well as from the excerpt above, it is evident students had begun to identify variables such as *time*, *cost*, and *number of workers*. One could almost sense the task-orientedness of this group as they immediately began working toward a solution. The identification of variables was an important step towards framing their conceptual representation.

Interpretation of the problem situation

It was clear that the pupils' interpretation of the problem situation as a conceptual representation overlapped and interacted with a mathematical model that was emerging.

S3. *Within 4 days* (reiterating the condition).
S5. *Within 4 days. That means 12 and 4* (referring to 12 workers and 4 days). *Minimum 4.*
S2. *Makes 48.*
S3. *That means we do 12, 12, 12, 6* (sets a benchmark of 42 based on 14 workers x 3).

Based on the condition that a maximum of 12 workers could be hired per day, S5 proposed to have 12 workers per day for 4 days and was met with affirmation by S2, who added that the number of workers would total 48. S3 conjectured that the model should be 42 instead of 48, because he took the perspective of having a minimum of 14 workers per type of service for the 3 services, thus conceptualizing 12 workers for the first three days, and 6 workers for the fourth day. At this juncture, they were trying to frame a model to accommodate the number of workers that would fit the conditions specified. A mathematical model seemed to be emerging, although very tentatively. There was still much to be processed by the pupils, as at this point they had not yet thought about combinations of workers within and between services.

Interrogation of data/information

In order to make sense of the data, the pupils realized the need for a common basis for comparing the costs of the workers.

S3. *So we have to make them the same. LCM of 4, 5, 6.*
S5. *Huh? LCM?*
S4. *Lowest common multiple.*
S5. *I don't see it.*
S3. *LCM. Lowest common multiple.*
S5. *Oh. But I was like…what?* (Still not sure what S3 had meant by LCM in relation to the task)
S3. *So that you can find out, based on 60 workers you can find out which is the cheapest.*
S4. *Why 60?*
S3. *That's the LCM.*
S5. *What about 7? There's a 7 you know?* (pointing to company H)
S3. *We are doing Cleaning, which is why I suggested 4, 5, and 6.*
S5. *Sorry, I didn't see that.*

To have a valid common basis for comparing the cost of workers, S3 suggested they use the lowest common multiple (LCM) for the number of workers. S5 was not sure what S3 had meant. This is not surprising because the use of the LCM is a more tedious approach to set a common base, when an easier approach would be to find the cost per worker. Nevertheless, S3 later clarified that he was referring to the Cleaning Service workers only, and the LCM was found to be 60. The derivation of the LCM and the corresponding costs for the workers is captured in the pupils' written calculations, reproduced in Figure 2.

They titled this document "Lowest Common Multiple, Combination and Comparison." Through their interrogation of the information, they were able to connect with the mathematics appropriate for tackling the problem.

Inquiry within investigation

As the pupils searched for their "perfect" combination, the recordings captured instances where they went back to better understand the problem situation. Clarification was needed, and was duly provided by those who had a firmer conceptual-mathematical system in mind.

S5. *But we can only hire up to 12 per day* (explaining to S2).
S2. *But each company doesn't have 12.*
S3. *So you have to combine.*

Figure 2 **The LCM Approach**

To compare, find the LCM
Cleaning

A → 4 → $160	x15	A → 60 → $2400
B → 2 → $76	x30	B → 60 → $2280
C → 6 → $270	x10	C → 60 → $2700
D → 3 → $120	x20	D → 60 → $2400
E → 5 → $175	x12	E → 60 → $2100

S2. *On each day we only can hire 12? So how can we get that?*
S3. *That's the problem.*
S1. *6, 4, 2* (Proposing number of workers for Cleaning).
S5. *But it looks expensive.*
S1. *But you have no choice because you want to maximize for the whole day.*
S4. *It can be 5, 3, 4.*
S5. *Wait…*(punching on the calculator) *445* (obtained from 160+120+175, using A, D and E, and then he worked on the other combination). *Hey, you're right, this one is cheaper* (the 445).

S2 was getting confused, as none of the companies listed had as many as 12 workers, and thus, in his view, they could not hire 12 workers per day from a company. His inquiry led his friends, S1 and S4, to propose possible combinations and also set in motion the inquiry into which combination would be better. That eventually led S5 to make an informed comparison of the two proposed combinations. At this early stage of the investigation, their initial inquiries enabled them to generate possible frameworks for a type of service.

Introspection in monitoring

In the midst of the mathematization process, one could see the pupils monitoring their own thinking. This metacognitive aspect is important in that it shows self-questioning about their understanding, strategies and progress towards resolution of the problem.

S3. *Know what? Actually I was pretty dumb. I could have just calculated the cost of one worker to find which is the most expensive instead of doing this* (as in the LCM method).
T. *That was why I asked you to explain why you were doing this just now.*
S3. *Exactly! I'm so dumb. Somebody smack me.*
T. *But does this work?* (referring to the LCM method)
S3. *Yeah, it does work, but it's a lot of calculations* (pause as pupils continue to do their own computations).
T. *So what is your strategy now? Do the rest of you know what he* (S3) *is doing?* (asking the rest about the LCM approach that S3 has earlier proposed).
S3. *They're actually doing the same thing* (as in the same method as he).

When the teacher sat down with the group to observe, S3 brought up a matter he was troubled about. It had dawned upon him that his initiative to use LCM for comparison was not such a good idea, as it was tedious. He admitted he could have worked out the cost per worker instead of finding the LCM for the number of workers. Actually, much earlier, the teacher had asked him about the LCM approach but did not intervene to suggest otherwise, because the pupils had agreed on using the LCM idea. Nonetheless, the use of the LCM was workable, as S3 confirms in this excerpt. The pupils decided not to change their approach, but to continue using the LCM to find a common base.

Improvement in conceptualization

The pupils' initial conceptual model was to hire 12 workers from one particular service for a day's work, and then to hire another 12 workers from another service for another day's work. This model was based on hiring workers within a single service for each day. As they discussed the problem further, they progressed to thinking about hiring workers across services each day.

S1. *Maybe we need to have like Monday all these,* (showing a combination of cleaning, painting, and moving services), *Tuesday also all these, and Wednesday all these.*
S5. *The thing is that we need 14, we need a good combination.*
S4. *What good combination?*
S5. *OK, the right combination.*
S2. *Without changing the task* (noticing that S1 refers to combination across different services).
S1. *You have to have all the combinations* (using his pen to indicate across services from the task sheet).
S3. *Because you can't have all the cleaning on one day, and all the painting on another day, right, as at most you can only have 12? Unless, we have this condition. I can make this up as one condition: Cleaning, painting, moving, one day* (as seen from folding-in of fingers as in counting to show each service for each day), *and then the last day a combination of all three.*

S1 directed the members to the possibility of hiring workers across services for each day. That implied hiring workers from different services to make up 12 workers per day. As this initiative was brought up, S3 proposed they could still have a model where they could work within services for each day for the first three days but across services for the fourth day. The two proposals show that the pupils' conceptualizations have progressed to a higher level of sophistication, and gained ground towards developing a firmer mathematical representation.

Intervention to extend thinking

To help the pupils understand something about optimization, this model-eliciting task comes with a simple formula for calculating the productivity index (PI) to enable the pupils to compare whether their selections of workers offer value-for-money. The PI was to be determined after they were satisfied that they had obtained a set of plausible combinations. The teacher checked the pupils' understanding of the PI and then challenged them to optimize their combinations.

T. *Maybe we should take a look at this productivity index. You see the numerator and the denominator. What does that tell you?* (pointing to the formula in the task sheet)

S3. *That the smaller the denominator, the larger the number will be. You see, the total cost has to be as low as possible.*
T. *So what about the numerator?*
S3. *Numerator has to be the same throughout. It has to be 42 because it's 14, 14, 14.*
T. *Are you sure?*
S5. *At least 14.*
S3. *Yes, we try to keep it as low as possible.*
T. *OK, if I want to get a high productivity index, what must I do to the numerator, and what must I do to the denominator?*
S3. *Denominator must be as small as possible and numerator as large as possible.*
T. *And numerator is the number of workers.*
S3. *Which means we can exceed.*
S5. *Then we must maximize it*
S3. *We are allowed to exceed it, right?*
T. *Based on the conditions?*
S5. *Yes, they say "at least 14 workers" so we can exceed 14.*
T. *Yes, but per day you can only have…*
S5. *At most 12. So the maximum can be 48, because there are 4 days.*
S3. *So that means we can exceed [the three-day maximum number] by 6.*

The pupils had developed a mathematical model based on 42 workers across services per day for four days. Their model was a 12, 12, 12, 6 framework, meaning having 12 workers for the first 3 days and 6 workers for the last day. The 42 workers were based on the understanding of having 14 workers per service. The presence of the teacher at that juncture served to make the pupils' understanding of the PI visible. The teacher queried what the PI meant and realized that S3 had fixed a ceiling to the number of workers for each service. Upon further probing if the numerator could have an effect on the PI, S3 realized that the numerator should be made as large as possible. Quickly, the pupils' thinking shifted to make the ceiling 48 instead of 42. They subsequently made some adjustments to their combinations, which was not too difficult.

This excerpt shows the role that the teacher plays in scaffolding. It

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affirms that the teacher was able to raise the level of the pupils' thinking through her questioning, without supplying them with the solutions. The pupils realized what they had missed, then revised and improved their framework and their combinations accordingly.

Implications

Model-eliciting activities can make pupils' mathematical thinking visible. The pupils in these examples solve real-world problems mainly on their own (with their peers), while the teacher acts as a facilitator rather than a prescriber of knowledge.

When pupils work on model-eliciting activities, they create mathematical ideas that are embedded within the tasks. They develop important mathematical processes that facilitate their development of generalizable conceptual systems. They have to draw on their domain-specific mathematical knowledge, and transfer such knowledge to real-world contexts in order to interpret, analyze, explain, hypothesize, conjecture, compare, and justify their thinking. As they organize their thinking, they are developing conceptual representations of the problem situation. In the

process, they continue to modify, refine and extend their conceptions. Their models are constructed in meaningful ways, as they involve conceptual understanding and mathematization. The models are seen as powerful tools for solving real-world problems. The excerpts illustrate that pupils were able to identify goals and variables, interpret problem situations, inquire and investigate, interrogate the information, and engage in metacognative introspection. Subsequently they were able to improve their conceptualizations through metacognitive thinking and the teacher's intervention.

Pupils are also seen to be involved in genuine problem solving, because the givens in the task are not as clear-cut as those found in standard word problems. Because the model-eliciting tasks are challenging and authentic, they are consistent with the community's understanding of what a problem is: encountering obstacles and getting stuck with no immediately obvious solution. Model-eliciting activities therefore place high cognitive demands on pupils, and require them to exercise thinking that is beyond what they normally do than in solving traditional word problems. Since the problem solving involves iterative modeling cycles, it also places a high demand on the pupils' metacognitive capabilities. In this context the potential advantages of working collaboratively with peers and of accessing the teacher as a facilitator become apparent. Such a pedagogic approach embraces sociocultural aspects deemed to enhance learning in complex situations, where the assistance provided by more knowledgeable peers or experts is posited to raise the other members' level of performance or thinking to levels that would not be possible had they worked independently (Vygotsky, 1978).

Having seen the benefits of employing model-eliciting tasks, I sense the need for mathematics classrooms to take our children to the next level of doing mathematics. Traditional approaches would still have a place in the curriculum but they should not be over-emphasized. Without the proper help and support for teachers in making the transition, any radical adoption of newer pedagogic approaches—and the consequent alteration of existing classroom norms—might do more harm than good. Nevertheless, traditional classroom norms can be changed by *gradually* making more room for construction, interaction, and reflection. Teachers can help by eliciting the pupils' knowledge—content, procedural and reflective—about solving mathematics problems, and helping them make connections to real-world applications. After all, as Zbiek and Conner (2006) put it, to be involved in mathematical modeling would require "both deep understanding of known curricular mathematics and the motivation to learn new curricular mathematics" (p. 110). My experience from fieldwork with both high- and average-ability pupils, and my understanding gained from the literature, have strengthened my conviction that our pupils are ready for tackling modeling problems. Model-eliciting activities should be introduced into the mathematics classroom to build our students' understanding of the utility and power of mathematics for arriving at real-world solutions to real-world problems.

Conclusion

The revision to the Process component of the Singapore Mathematics Curriculum Framework suggests a more communicative and constructive approach in developing students' mathematical thinking. Mathematics learning has to take into consideration real-world situations, and modeling activities are seen as the catalyst for promoting mathematical reasoning and making learning meaningful. Mathematical modeling activities look promising with respect to providing pupils with opportunities to develop mathematical processes that traditional problem solving approaches would not. Because mathematical modeling holds promise in significantly impacting mathematical thinking and development, there is a need for more research to investigate ideas and concept development in the light of using such activities, and in particular, to better understand how the aspects of metacognition, motivation, and social interaction contribute to pupils' mathematical development.

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Teaching Students to Read and Communicate in Science and Mathematics

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Many hold the view that success in the disciplines of science and mathematics depends primarily on competence in computing, calculating, and manipulating figures and formulas. While it is certainly true that these thinking tools are essential for scientists and mathematicians, communication skills may be equally important (Cowan, 1991).

I want to argue, therefore, that c*ontent learning* and *content literacy learning* are one and the same. In other words, learning the content of disciplines such as science and math is as much about learning to read, write, and talk about the content as it is about learning the concepts and facts (Moje, Callazo, Carrillo, & Marx, 2001). To put it another way, academic literacy and disciplinary knowledge are inseparable. Thus, teaching reading, writing, and thinking skills in academic disciplines *is* teaching the disciplines (Brozo & Simpson, 2007).

In mathematics for example, many studies have identified linguistic structures that are used in ways that differ from everyday discourse, creating challenges for students (Schleppegrell, 2007). While challenges involving common language forms used in specialized ways may be most obvious in word problems, which demand analytical and critical reading skills, it is important to recognize that such challenges are also inherent in "reading the language of mathematics itself" (Adams, 2007, p.117).

Another reason why students experience difficulty reading mathematics and science information is the conceptual density of these texts. A secondary school science textbook may contain as many as 3000 new vocabulary terms, more than students are likely to encounter in foreign language classes (Barton, Heldema, & Jordan, 2002).

Teachers can help students meet the challenges of comprehending mathematics and science material, and help them become better communicators of their knowledge in these disciplines, by employing effective strategies. The three strategies that follow are designed to engage students in analytical thinking, focus their attention on important information, and provide them with metacognitive tools for reflecting on and expressing new understandings.

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Extending levels of thinking

Many readers have difficulty understanding information in text unless it is stated word-for-word. Without the ability to think beyond directly stated information, readers often miss the author's important points. One good way to teach students how to comprehend a text on different levels is by sensitizing them to the different levels of thinking needed to process information and ideas. Students in mathematics and science need to be shown that thinking about a text can reflect either the *directly stated* information, labeled *What it Says*; the *implications* of the words on the page, labeled *What it Means*; or possible *uses* of the author's information and ideas, labeled *How it Applies*. Notice how these three different levels of thinking are all needed in order to understand or generate the five statements below as they relate to the given passage on interest rates.

Interest rates are the signals that affect the moving of funds to borrowers from suppliers/savers through financial intermediaries. Since interest rates and time are closely related, the expression "time is money" is helpful in understanding the financial demand–supply linkage and, in turn, the determination of interest rates.
A lender's requirement to be compensated—and a borrower's agreement to make that compensation—is what interest and interest rates are basically all about.

says	Interest rates and time are related.
applies	The more time I allow for my loan to be repaid, the more money I make in interest.
means	Interest rates are determined by a lender's and borrower's agreement as to how much the lender will be paid back.
applies	My bank is a financial intermediary.
means	Interest rates are related to how many people want to borrow money and how much money is available to be borrowed.

Providing students with opportunities to become aware of different levels of thinking promotes sensitivity to various ways of processing math and science texts. Comprehension practice should be designed to encourage various ways of thinking about a text. If students are only required to process information at the level of *what it says*, they will likely form a superficial understanding of text. On the other hand, if students are taught to extend their thinking to the levels of *what it means* and *how it applies*, they will come away from their encounters with texts with broader and more useful understandings of math and science (Santa, Havens, & Harrison, 1996).

Organizing information and ideas

Because science and math texts are laden with new and unfamiliar concepts and vocabulary, students need a logical and meaningful way to organize the content to make it easier to study and recall. This can be accomplished using the split-page notetaking strategy.

Students create split-page notes by using a ruler or some other straightedge to draw a line from top to bottom on each notebook page approximately 2 1/2" [6.4 cm] from the left margin. The goal is to split the page into one-third/two-thirds columns. In the left column students are to write major ideas, key dates, names, questions, etc.; in the right column they provide supporting information for the points noted. Students should be encouraged to paraphrase and abbreviate as much as possible. They can study their notes by covering either the right or left column and using the information in the other column to prompt recall of the information that is concealed.

This note-taking method has many advantages over other

Chapter 11, Metallurgy
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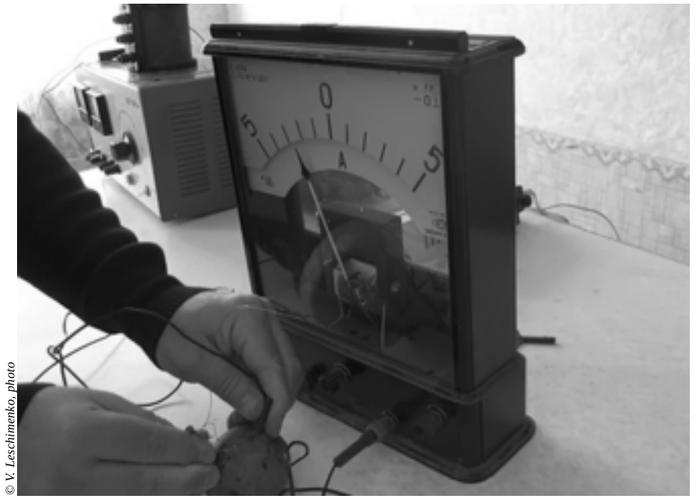
Metallurgy	taking metals from ore refining ores preparing ores
Ores	rock or mineral metal obtained profitably
Metallurgy of iron	
Iron age	began 1500 BC 5000 BC meteorites were used
Iron	4th most abundant reddish brown
Taconite	found at Lake Superior 25%–50% iron crushed/refined



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ability to summarize, paraphrase, and get the gist.

See an example of split-page notes for a textbook chapter on metallurgy on p. 47.

Reflecting on new learning

Math and science students need to put newly learned concepts and information into words in order to demonstrate understanding for themselves and to communicate what they know to others.

Microthemes, which are succinct statements on a specific topic, are ideally suited to accomplishing these comprehension and metacognitive goals. Microthemes are short enough to be written in five minutes on a single notebook page and can be quickly shared with a classmate. Once new content has been presented, studied, and applied, students should be asked to respond to microtheme prompts related directly to this content, as in the prompts below for exponents in math.

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Most students in mathematics and science classrooms know how to read, but too few of them know the important thinking and communication processes needed to make their learning more effective and meaningful. Math and science teachers who model and use strategies such as levels of thinking, split-page notes, and microthemes will help students expand their content knowledge as well as content literacy.

Integral Exponents
Rule 7 is in addition to the previous rules you have worked with in other chapters. In your own words, explain what this rule means and how you might use it to simplify 224 and 1/423.

Rational Exponents
1. Define *radical*, *index*, and *principal root*. Identify each in an example you supply.
2. The *cube root* of a number means_____.

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