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Just what are these new promises? Let's get clear about them and what we have to do to fulfill them. The authors' histories of studies of teaching and how teachers learn are combined with their studies of media technology and school renewal. The result is three basic ideas for incorporating contemporary technology to enrich curriculum, teaching, and student learning.

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Since the publication of the *Handbook of Formative and Summative Evaluation* (Bloom, Hastings, & Madaus, 1971), school improvement initiatives have virtually battled to increase the formative study of learning in classrooms and at the school, district, state, and national levels. Action research walks hand in hand with improvement. Test makers and the use of term-end and year-end grades on transcripts have drawn education toward summative evaluation. Federally mandated high-stakes testing has made summative evaluation pervasive and made formative study difficult. Equally important, test makers have rarely used performance measures, yet formative study requires them. We discuss the rationale and procedures for bringing about long-overdue change and the dilemmas faced.

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A coda reviews current popular literature, some of which contains worries that the coming of information and communication technology will be bad for our minds and our habits. We do not agree and say so. We see the advantages as far greater than the dangers.

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1

A New Chance to Live Our Dreams

A tantalizing wave of Information and Communication Technology (ICT) is flowing over us and beckoning us to actualize our most ambitious dreams for schooling—NOW.

. . . Our Reflective Observer

A PROMISE WRIT LARGE

The major promise of our present time is to make an education that provides excellence for all. Both parts of the promise—*excellence* and *all*—are vital for our citizens, our society, and our place in the world.

As goals they build on the aspirations of our predecessors. Possibly none of them captured the promise better than Ortega y Gasset did in 1930 (1992). Paraphrasing slightly in translation . . .

The mission of education is to enable people to live at the level of the highest ideas of their time.

By *live* he meant to have the inclination and ability to have a very high-quality life *and* contribute to the commonweal, both near at hand and far removed. He saw the academic and social as essential sides of the same coin.

♦ The tremendous energy and powerful tools coming into our global society through the digital (read Information Communication Technology) revolution give fresh impetus to our age-old aspirations. Essentially, we can renew school renewal—and some of those new tools will give vitality to some high-potential curriculums and models of teaching that have had only limited dissemination in the past. Better curriculum and teaching will be the vehicle of change. Extensive professional development will be its engine.

Curriculum (what is taught) and instruction (how it is taught) can be elevated substantially. The social climate surrounding education will be enriched as more dimensions of communicating bring local students and parents closer together and connect them with cohorts all over the planet.

Although digital technology will add a wealth of information and ideas to the curriculum, its major impact will be on how students learn to think—how they build ideas and skills—and how they collaborate with one another.

As this is written, futurists and technology enthusiasts discuss possibilities and gnaw at the social implications. Mobile devices have enjoyed an extraordinary acceptance across the planet and are palpably changing human interaction and access to information.

However, education will *not* change much or improve greatly simply by making ICT more available in schools. We must rebuild curriculums and alter instruction if education is to improve. Educators, rather than technology providers, will need to do most of the “heavy lifting,” although technical assistance is needed and distance courses can help greatly in some areas. Distance learning and virtual schools are changing the opportunities for learning in school and home. Although many current courses and programs were developed by commercial providers, we believe that the open source concept currently being advocated and currently promoted by the Gates and Packard foundations will result in more and better offerings.

The faculties in the schools that are leading the pack in the incorporation of ICT have done a great deal of hard and exhilarating work right where they live and teach. In those settings, home and school work together in fresh and more powerful ways. Interchanges like this are becoming common: *Parent post to Teacher’s website*. I don’t think Rory understands the arithmetic assignment. *Teacher to parent*. After reading your post, I reviewed the assignment with Rory. Does he understand it now?

The rigorous development in those schools needs to take place in *all* schools.

We will keep saying *all*. Most children from economically poor families have been terribly disadvantaged by the education available to them, and the spread of digital technology is very uneven. The disparities of the past will be magnified exponentially if educators do not turn that tide. Schools must ensure that access to good education, including the digital dimension, is equitable.

The infrastructure of schools, including technology on one hand and professional collaboration and study on the other, requires serious attention. With respect to technology, we are beginning to see schools that are

wirelessly connected to homes, where all students are provided with laptops and smartphones upon registration and where interactive whiteboards and their successor devices are in all instructional settings. These devices run on software that makes self-instruction a central dimension of schooling. At the same time, decades of experience with successful and unsuccessful school improvement initiatives have made it clear that high-quality professional development should be considered part of the essential infrastructure—the motor that drives the improvement of curriculum and teaching.

The territory of this book is the needed work to fulfill the tremendous promise of this time. We intend it to outline avenues to development that can be done right now as schools, districts, states, and federal agencies redevelop curriculum and teaching. The incorporation of digital technology can serve as a springboard toward a renewal of school renewal.

We write from our view of the processes needed to begin to capitalize on ICT. A good many resources will be mentioned, and an annotated bibliography is provided to guide the reader to the help available. But avenues for development make up the core of this work.

WHAT WE HAVE LEARNED ABOUT TEACHERS, TECHNOLOGY, AND PROFESSIONAL DEVELOPMENT

The incorporation of media into schooling has been a century-old process. And we, the authors, have been involved in this process for a good many years. We have been paying attention to teachers and ways of teaching for a very long time. Collecting data on how people teach—and how they *might* teach—became the focus of our work, individually and together.

Early on, we began to study the ways teachers teach and alternative ways of teaching. In our early careers, the study of teaching and learning had attracted a considerable number of researchers. They were producing a great deal of information about how teaching is usually practiced and about alternative approaches to teaching. Most of the researchers were looking for a few solid principles that would define good teaching in general—teaching for all purposes.

However, students need to pursue many objectives. Innovative teacher-scholars had generated a variety of approaches to teaching that achieved different objectives or, sometimes, accomplished similar objectives but in different ways. As Bruce and his colleagues studied those approaches, it became clear that rather than there existing a few overriding principles of all-purpose teaching, there were a number of valid models,

grounded in beliefs and supported by research. We studied them, clarified the teacher and student skills needed to use them, and conducted research on them, particularly on their interaction with the diverse learning styles of students. The idea that there is a storehouse of models is an enduring theme of our work to the present (see Joyce, Weil, & Calhoun, 2009). Our inquiries on how learning styles interact with alternative models of teaching were particularly influenced by the conceptual-level model developed by Harvey, Hunt, and Schroder (1961). We became close colleagues with David Hunt while conducting a long series of studies of student response to alternative learning environments (see Hunt & Sullivan, 1974). Emily built on the work of many earlier educators such as Gagne, Taba, and Stauffer in developing a multimodel approach to teaching beginning reading and writing (Calhoun, 1999). An important principle undergirding this work is that, to learn and use complex skills, students need to see them, understand them, and practice them so that these skills become a natural part of the learning repertoire.

Another Focus: How Teachers Learn

Another theme in our careers has been the study of how teachers learn. In the 1970s, many educators believed individual teachers' methods were a product of their personalities. The concept of professional repertoire was new, and many doubted that new teachers could learn approaches to teaching that did not fit with their personalities. However, there was a dearth of data about how teachers learn.

We became part of a community that focused on the nature of competence in teaching. That community conducted extensive research to learn whether teachers could learn to teach in ways different from the ones they "naturally" brought to teaching. We found that teacher candidates could acquire a wide professional repertoire, one far beyond the recitation model that has historically dominated teaching. Personality was a factor, but not a limiting one (see Harvey et al., 1961; Joyce, Peck, & Brown, 1981).

How Do Experienced Teachers Learn? Implications for Professional Development

We extended the study of preservice education to professional development contexts. It turned out that experienced teachers also could extend their repertoires considerably. Furthermore, they could increase the achievement of their students significantly by using models more appropriate to the course goals, whether those of the teachers or the students, and by being better able to accommodate teaching styles and learning styles (see Joyce & Showers, 2002).

However, teachers do not expand their repertoires simply by reading about them or listening to talks about them. We learned that teachers acquired new teaching strategies by studying the rationales of those strategies, watching and analyzing several (a dozen or more is best) demonstrations, and preparing practice in the core curriculum areas. And transferring new practices into their active repertoires took time and collegial companionship. To facilitate transfer, we developed peer coaching—teachers helping each other use their new learning. Implementation rates rose from about 10 percent after traditional professional development workshops to about 90 percent when peer coaching was employed after the theory-demonstration-practice strategy was used in workshops.

Importantly, this line of work demonstrated that teachers have the capacity to add considerably to their repertoire—that they are not trapped in a narrow range of teaching strategies (see Joyce & Showers, 2002). This finding is particularly relevant to the current challenge to incorporate new media into the curriculum. As with students, for teachers to learn complex new skills, they need to see them, understand them, and practice them until the skills become a comfortable part of their teaching/learning repertoire. Essentially, teachers need to become comfortable in a digital environment.

School Improvement of Size: Concentrating on Literacy

In the last few years, we have been drawn toward collaborative school improvement projects with schools and school districts where knowledge of professional development, models of teaching, and action research are brought together. These projects have demonstrated the considerable magnitude of increase in student learning that is possible within relatively short periods when students are taught better tools for learning (see Joyce & Calhoun, 1996). Emily's extensive studies of action research in more than 100 schools were important in helping us estimate the amount of support necessary for teacher and administrator leaders as inquiry modes are used in school renewal.

We have concentrated on literacy in Grades K–3 and in a Grades 3–12 curriculum for struggling readers. With our colleagues in Canada, we have generated evidence that the use of the Picture Word Inductive Model of Teaching (Calhoun, 1999) as the core of the literacy curriculum can generate considerable rises in rates of learning to read and write (see Joyce & Calhoun, 2010, for reports of the studies). In the Northern Lights School Division in Alberta, we and Marilyn and Walter Hrycauk have followed for eight years kindergarten students who were taught to read. During that time the students have, year by year, increased their lead over comparison groups of students. To help others conduct action research on

the teaching of reading, Emily has authored a book focusing on the assessment of reading curriculum and instruction in schools and classrooms (Calhoun, 2004). We continue to marvel at the learning capacity of both novice and experienced teachers.

TECHNOLOGY AND EDUCATIONAL PRACTICE

Media has been a recurrent component of this work, reminding us that both electronic media and digital technology have been available and used in some settings for a long time. Bruce was connected with innovators in educational media, including *Sesame Street*, and wrote extensively about the integration of media in schooling (see Joyce, 1967, 1972). To support curriculum research, he and his colleagues developed data banks for children's study of cultures and studied students' inquiry into cultures foreign to them. The work anticipated the development of digitized data banks as the technology became available. In the 1970s, Bruce directed teacher education programs in which teams of teacher candidates and cooperating teachers videotaped lessons as they learned to use research-based models of teaching. In seminars, they studied their lessons and used observational systems for studying teaching that resulted in data being placed in computer files. Students and faculties used those files to track the developing teaching styles and, as student learning was studied, to inquire into whether various patterns of teaching and models were related to effects on student achievement. These data were important in our learning that teacher candidates and their cooperating teachers could master a considerable range of models of teaching and use them effectively.

Very few teacher education programs used electronic media to the extent we and our colleagues did at that time (see Joyce & Clift, 1984)—and only a handful do today but for us and our colleagues, the study of various models of teaching has continued. From that research we identify those ways of teaching that are most promising for integrating electronic technologies into the curriculum.

The learning from our professional work brings us to where we are now.

Throughout the book, the reader will find that the lessons from these histories guide our approach to an integration of technology that can generate great improvement in what students learn and how they learn. The incorporation of digital technology into schooling can be accomplished by paying attention to just three straightforward propositions.

1. Incorporating digital technologies into the learning environment begins as teachers rework courses (K–12) to take advantage of the “New Libraries” (a term we devised to describe the vast collection of resources