The Case for Systemic Restructuring as a Key to Information Technology Integration in Education: A Response to van den Akker and Plomp

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I n a recent article published in *Teaching Education*, our colleagues at the University of Twente (van den Akker & Plomp, 1993) argue that what is needed for effective integration of information technologies in our public schools today is *not* systemic restructuring. Instead they call for placing teachers at the center of implementation issues associated with information technology, particularly computing solutions for classrooms. Our response addresses issues raised by these educators and argues that, while teachers are indeed central to changes in schools, what is necessary is a fundamental shift to a *new system of learning* and away from treating technology as an end in itself. Substantial innovation in the use of information technology in classrooms is unlikely to take place without attending to broader issues of systemic change (Banathy, 1991, 1992; Reigeluth 1989, 1992).

Van den Akker and Plomp's major point — how to integrate technologies into schools — is a hammer in search of a nail. We must first ask ourselves why we need technologies in schools at all. What's wrong with schools as they currently exist? What about them doesn't work? Will technologies solve these inherent flaws? Technology itself is not a magic formula, nor is its existence in schools equal to an innoculation against student failure. Rather, we should view technology as one *part* of an overall plan for school change.

Van den Akker and Plomp seem to acknowledge this point when they state that "to succeed, one must abandon the desire for quick fixes of complex problems through simple measures and devise, instead, a versatile, continuous and well orchestrated approach for bringing about lasting and substantial changes" (p. 31). We are surprised that they see systemic change as something different from "lasting and substantial changes." And what approach do they suggest? They offer us very admirable and necessary *parts* of a new system, including increased consideration for the teacher when thinking about new technologies, improved teacher and pre-service teacher training, and better documentation accompanying hardware and software (see Figure 1). While necessary, these are, on their own, not sufficient to bring about the needed transformation in schools to which technology may contribute.

Figure 1. Our Interpretation of van den Akker and Plomp's Goals for Infusion of Information Technologies
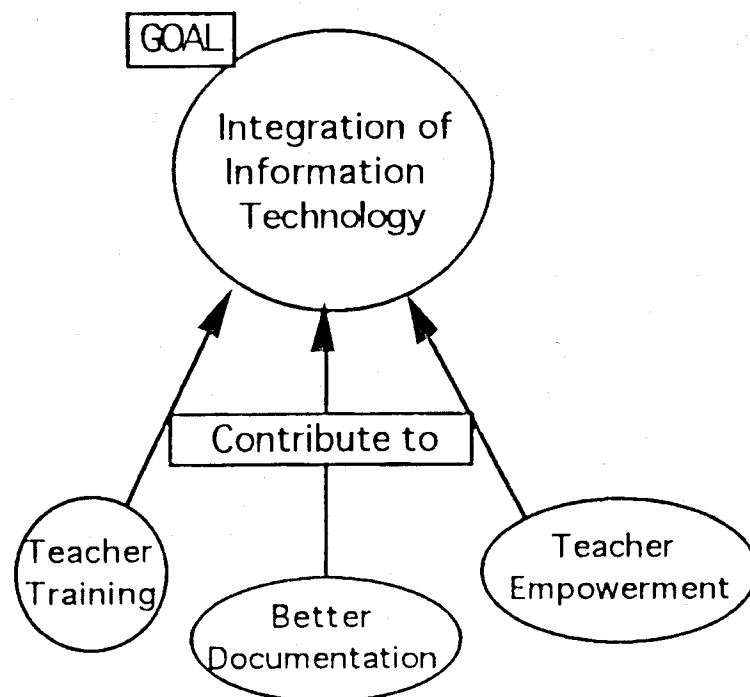
Such "tinkering" with the overall education system is likely to cost substantially while not improving the education of children appreciably. Branson (1987) makes this argument admirably, pointing out that our current system of education is at its "upper limit;" major expenditures, including large infusions of technology or better teacher training, will not lead to significant difference as they could if we devoted them to a *new* system of learning.
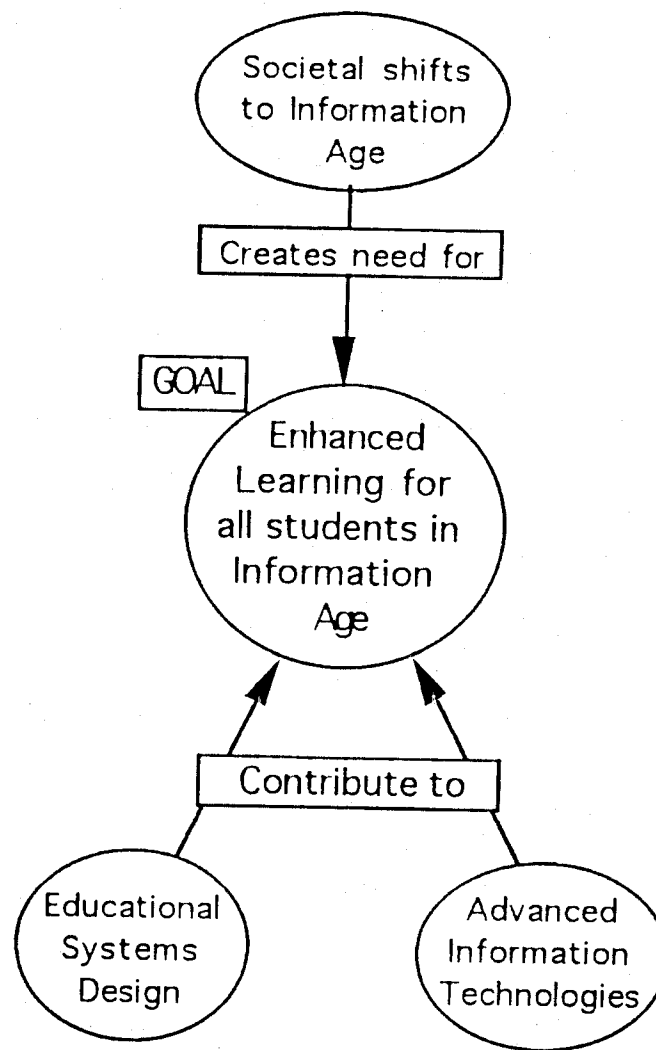
Thus, our first step to improving learning in schools is to recognize that schools aren't working as well as they need to work. Students aren't learning as *much* as needed, nor are they learning the *types* of skills and concepts required for success in the information age. Part of this difficulty is that children learn differently. Teacher-centered instruction and group-based progress inhibit individualized learning to a level effective for all children in an equitably manner.

Of course, other factors affect children's learning within this system as well. Parental support and modeling, social expectations for certain populations, and various "hidden curricula" are inherent socio-cultural weaknesses which continue to stratify students into those who succeed and those who fail (Spring, 1976). As we have seen recently, technology can simply exacerbate these institutionalized inequities rather than help schools focus on meeting the learning needs of students. Finding better ways of applying technology under the old paradigm cannot advance human learning sufficiently to meet the educational needs of the information society. We must organize schools around the principles of continuous progress, personalized learning, and attainment-based achievement in order for technology to have a genuinely positive effect on learning.

Social shifts (such as the move to an information society) require the schools to change. In responding to these shifts, schools encourage further social changes (such as a deepening investment in educational outcomes for an entire community). Apparently, this scenario is the sort that van den Akker and Plomp criticize as utopian vision when they state: "Beneficial as some fundamental changes in the educational system may be, they risk widening the perceived gap between utopian visions and day-to-day practice in most classrooms" (p. 30). However, we view such visions not as utopian, but as necessary to meet the needs of an information age. The more important question is, are these visions justified? Should we promote fundamentally different visions of education that are better suited to a changed world? Or should we encourage teachers to go forward with narrow visions of innovative schools as enabled by technology alone? As we illustrate in Figure 2, a thorough re-thinking of the current system is integral to the infusion of technology if we do not want technology to become another failed fad offered to schools as a panacea.

It is not productive to shrink from the challenges of broad-based transformation called for in the systemic change movement. While these transformations can be seen as idealistic, they are necessary to change schools' focus from sorting to learning. A good program of systemic design should include implementation plans for hard technologies, yet these technologies cannot be considered in isolation if we hope to have lasting change affect schools.

Figure 2. Goals of Educational Systems Design

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                    │  Societal shifts │
                    │  to Information  │
                    │       Age        │
                    └─────────────────┘
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         │ GOAL │   │    Enhanced      │
         └──────┘   │  Learning for    │
                    │ all students in  │
                    │   Information    │
                    │       Age        │
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          │  Educational │    │   Advanced   │
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          │    Design    │    │ Technologies │
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Some theorists in the instructional technology field, including van den Akker and Plomp, continue to push technology, itself, as "the solution" to, rather than a natural part of, the broader systemic reform necessary for improved systems of human learning. These educational technologists resist the imposition of change strategies seemingly useful for the advancement of new curricular or social goals, electing instead to simply introduce the technologies and expect that they will solve problems by their very presence. However, recent work (Bromley, 1992; Bowers, 1988; Winner, 1986) suggests that technologies carry with them a whole set of predispositions which may actually inhibit change or at least direct it in undesirable, even biased ways.

Such bias can be seen when van den Akker and Plomp call for experiences in which teachers can "acquire clarity about the meaning and potential of the innovation, gain confidence in their own competence, and

develop their own view of the appropriateness of the innovation for their students and themselves" (p. 33). While important, is this a sufficiently radical change to prepare students for the 21st Century? This position assumes a specific innovation or technological solution is *necessary and sufficient* without questioning the basic understandings and visions of what schools are or what they ought to be. How, for example, will the infusion of technology help a community come together and negotiate a shared set of values or vision for school?

In the end, van den Akker and Plomp may be asking the wrong question. They seem to be asking, "How can we integrate information technologies more effectively?" without first making the case for the importance of such technologies, and without first considering the positive impact systemic change can have on such an integration effort. We must first envision what we want for our schools. Then, we may determine the best way to get there, employing technology as an important tool for realizing our visions. Without questioning these basic underlying issues about education, we will continue to put hi-tech band-aids on our institutionalized and systemic school problems.

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Relevant Differences Between Systemic Restructuring and Systematic Innovation: A Rejoinder to Carr and Reigeluth

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We are glad to have the opportunity to react to the critical response of Carr and Reigeluth because, indeed, there seem to be some relevant differences between their point of view and ours. However, we must preface our remarks by saying that at times we had some trouble in realizing that it was our article they were criticizing. Probably, some of our rather skeptical remarks about "overly optimistic and simplistic" views on restructuring of education stimulated them to express their convictions about the need for such restructuring. Whatever the case, in formulating their message, Carr and Reigeluth make several peculiar statements. Some of these seem to originate from a careless interpretation of our article. Others have to do with their rather simplistic conceptions about educational change, at least in our view. And sometimes, it is a combination of both. We shall focus on two issues that seem relevant for the discussion about the integration of information technology in education.

What Is the Need for Information Technology in Schools?

A central argument has to do with the rationale for the integration of information technology in schools. Unlike the suggestion made by Carr and Reigeluth, we do not see information technology as a goal in itself, a "magic formula," or "the answer at last." It amazes us how they seem to have come to that conclusion. Admittedly, this fundamental question was not at the heart of our article, yet we paid some attention to it in the section "Is Leadership for the Integration of Information Technology Desirable?" We think that even our few modest remarks on the subject are

more concrete than their continuous, rather rhetorical and abstract calls for *new* (their italics) systems of learning. Their plea for (preferably radical and system-wide) restructuring appears to be based (at least in their article) on two arguments: an over-simplified criticism of current educational practice — without room for anything but negative perceptions — and some vague ideas about "preparing students for the 21st Century."

No doubt, both pairs of authors, if asked, are capable of formulating more precise and balanced statements about the potential aims of information technology in schools. We have been heavily involved in such discussions in the Netherlands, and as curriculum researchers (not "theorists in the instructional technology field," as Carr and Reigeluth label us), we feel very much at home with discussions about the what and why of education. However, our experience with curriculum evaluation tells us to expect striking discrepancies between the curriculum ideals in the minds or even the papers of innovators and the curriculum-in-action from the typical classroom.

With reference to the use of computers in education, international assessment studies (Pelgrum & Plomp, 1991) have revealed the very modest degree of implementation in most nations nowadays. These results underscore the prediction by Walker (1986, p.31) that "implementation problems will determine the type and extent of uses to which computers are put in schools, not the philosophical or theoretical claims and not the objective benefits to be gained from any given use." (See, also, the relevant distinction by Fullan [1991] between the 'objective' and 'subjective' meaning of change.)

Moreover, in-depth studies in pilot schools and experimental sites have sharpened our insights into the variety and persistency of implementation problems for teachers, even those who share the innovation visions and feel highly motivated to integrate information technology in the pursuit of instructional improvement. It is for these reasons that we are so much interested in implementation approaches from a micro-perspective. We cannot see how this serious concern for the pivotal role of teachers makes us "technology pushers" or leads to an image of "a hammer in search of a nail." Carr and Reigeluth oversimplify the debate with these statements. The relation between technology and educational improvement is more varied than they suggest. For example, schools *can* try to improve the effectiveness of their current curriculum and organization through the proper introduction and usage of information technology, just as "new systems of learning" can benefit from technology.

What Are Effective and Realistic Innovation Approaches?

A second important issue refers to the appropriateness of various innovation approaches in education. Carr and Reigeluth make clear that they have high expectations for systemic restructuring, which they seem to interpret as contradictory to "placing teachers at the center of implementa-

tion." In our opinion, this is an unnecessary and misleading contradiction.

In the section "Components of a Promising Scenario" of our original article, we started to explain that the interaction of individual teachers with technology is influenced by three categories of variables (at the national/state/district level, in the school organization, and in the external support services, respectively) which are more or less conditional for successful implementation. That summary (including references to more elaborate sources) made the point that changes at many levels of the educational system are necessary for effective changes on a large scale.

We can imagine that some of our U.S. colleagues have a strong inclination to rather drastic reforms of their educational system with its huge variety in quality (a wish for restructuring which has, of course, many other roots than the integration of technology in schools). However, they should realize that even large scale innovations should eventually be implemented locally (Fullan, 1991). Even in a smaller and relatively homogeneous educational system as we have in the Netherlands, it often appears difficult to bridge the gap between a macro (system) and micro (teacher) perspective. For us, combining those approaches seems more fruitful than opposing them. Thus, the discussion should focus on the mixture of strategies and the order and nature of innovation activities. (An excellent example of such an approach in Ontario is delivered by Fullan, Miles, & Anderson, 1987.)

We would also note that there are no strong arguments in innovation theory or empirical research for successful systemic change. However, the innovation literature does provide substantial support for systematic approaches which are characterized by cyclic, incremental, interactive, more evolutionary strategies, combining perspectives of various stakeholders. In such approaches, it pays to take the perspective of the teacher very seriously: 'Backward mapping' from their point of view and practical context is not only more effective, but does more justice to the concerns and values of teachers in the implementation of information technology (Olson, 1992).

It may be stimulating for educational researchers to participate in national policy debates on systemic changes. This hopefully does not prevent them, however, from making more concrete and immediate contributions through systematic development or formative research in which they carefully explore the potential of technology for educational improvement in practical settings. In the long run, that may be the most relevant contribution we can make as researchers.

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