

Systemic Change in Education

Envisioning a New System of Education

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In an earlier article in this book, Reigeluth indicated that the need for a new paradigm in education is based on massive changes in both the conditions and educational needs of the emerging information society, and that we must therefore analyze those changes in order to figure out what features our new systems should have. Furthermore, he discussed some of the most important changes in society and identified their implications for some general features that a new educational system should have.

This article presents a more detailed image of the features that appear to us to be emerging from the new conditions and educational needs of an information society. We call this image "LearningSphere 2000." The purpose of this article is to present one possible image of a different paradigm of education, to help those interested in systemic restructuring both to "jump out" of their current mindsets about education, and to offer some ideas they might find useful for their own new system. Although this image contains many features that are likely to be universal in a successful information-age system of learning and human development, it also contains many particulars that could vary from one community to another, and some controversial features that will vary as community values vary. Due to space limitations, no attempt will be made to justify any features. They are included as illustrative rather than prescriptive and to stimulate thinking rather than to present a solution;

not all aspects will be necessary or even advisable for any given community.

1. Learning Experiences

In the LearningSphere 2000 system, each student will have specific learning goals (set by a process described later). Progress will be continuous and personalized. The student may work on a goal in many different ways:

- alone, in a pair, or in a small team;
- with an expert (teacher or community member), a facilitator (assistant, volunteer, or student), or nonhuman resources (hands-on materials, computer-based resources, multimedia resources, or print materials);
- at a site in the community, a computer-based multimedia simulation, a hands-on learning lab, or a meeting room or library.

Learning will be an active process whereby the learner constructs meaning. Tasks that are vehicles for such learning will be "authentic" tasks, often in real-world environments, rich for learning. As students seek to solve real-world challenges, they will find the need for mathematical and communication skills and will then be more motivated to learn them. Most tasks will be interdisciplinary, drawing on both specific knowledge and such general skills as transfer of information across settings, negotiation and interpersonal skills, and decision-making skills.

Each learner must master a task before progressing to a task that builds on it. Students will gradually be given more and more responsibility for directing and managing their own learning, although some will require more structure than others. They will prepare for periodic performance mastery assessments. Great emphasis will be placed on finishing what they start.

2. New Roles for Teachers: Guides

To implement this vision of learning, the teacher must be more a "guide on the side" than a "sage on the stage." She or he will be an instructional manager and facilitator who helps the student and parent(s) decide upon appropriate instructional goals (subject to standards set by the community, state, and nation), and then helps identify and coordinate the best means for the student to achieve those goals.

A guide will assume responsibility for each of her students for one developmental stage of the student's life—approximately 3 to 5 years. Instead of grade levels, the school will be structured around five developmental levels (see Section 8, "Developmental Levels," below).

Each guide will work with a child for an average of four years, building a long-term, caring relationship. Mechanisms will be in place to appeal for a change if the parents, children, and/or guide are not pleased with the pairing.

Each guide will use apprentices, advanced students, and volunteers as assistants to further the learning and development of his students. Assistants and volunteers will be able to earn credits for their services. Those credits will entitle them to personal use of the learning centers (see Section 6, "Learning Centers," below) to continue their own education, or use of the child care center for their children.

3. "Clusters" as Schools

In professions such as medicine and law, colleagues often consult with each other, rather than always working in isolation. Unlike current teachers, they have a high degree of decision-making participation in, and control over, their organization. In a similar way, even though parents will choose a guide, that guide will not work independently, but will be a member of a "cluster" of guides.

A cluster will consist of about 4 to 10 guides (including a leader, a "master guide"), their assistants, and their students, and it will function somewhat like an independent contractor hired by the school district. In the larger industrial-age school buildings we have inherited, each cluster will occupy a separate wing or floor of the building, but will share some facilities, such as the gym, library, and cafeteria. Anywhere from one to a hundred clusters will be located in a single building, depending on its size. New educational buildings will likely have a very different design.

As does a lawyer in a law firm, each guide will have considerable responsibility for the success of the cluster and considerable incentive and authority to meet that responsibility.

4. Choice, Incentive, and Decision-Making System

Parents will request, in order of preference, about three to five guides for each of their children. An independent, district-wide, Consumer Aid Agency will provide information about each guide, as well as diagnostic testing and interviews to help parents make the best decision, or to make it for them if they won't participate. Each guide will decide how many children to accept each year, but will not decide which children to accept. That will be decided by a formula that maximizes the number of first choices filled district-wide, within the constraints of racial and socioeconomic balance guidelines. The guide's pay will vary directly with the number of students she accepts, as well as with the cluster's success in teaching.

If the number of first-, second-, and third-choice requests for all of its guides is high, a cluster will get a certain percentage increase in full-time-equivalent (FTE) money for its guides' salaries (regardless of how many students the guides accept). This will provide an incentive for all guides to improve and for the best guides to remain in teaching. The Consumer Aid Agency will help to keep this from turning into a popularity contest. Guides will be able to choose to take a reduced load, or may be forced to if they are in low demand.

Competition among clusters can have negative effects unless the system is designed to avoid them. Therefore, the salary supplement for each cluster will vary with the demand for its guides, not the salary supplement for each guide directly. The distribution of any salary supplement will be determined collectively by the cluster guides, and its guides collectively will decide how to spend their budget. This will result in a combination of *competition* among clusters (providing incentives for excellence and responsiveness to the community's diverse desires and needs) and *cooperation* within each cluster (providing support and encouragement among guides), like that characterizing most other professions.

Excluding the guides' salaries, the expenditure per child will be equal across all clusters for a given developmental level, except for supplements for special-needs children. A cluster will have full authority to decide how it spends that money, including the amount of space it will rent from the school district, the amount of learning resources it will buy or rent, and the number and type of support people it will hire.

A cluster whose guides are in high demand will be able to accept more students, hire more support personnel, and even hire (or promote from within) a new guide, like a new partner in a law firm. On the other hand, a cluster whose guides are in low demand will get less FTE salary money to split among its guides, plus its guides will receive less than a full (FTE) salary if they don't have a full load of students. Therefore, a guide who is not successful will receive less money, as happens in other professions, and may decide to look for another job. In this way, personnel hiring and firing will be removed from a bureaucracy-based decision-making process and turned over to a client-based system that allows for constant adjustment to the changing needs of the community. "Incubation" policies will encourage the formation of new clusters. And a rating mechanism will exist whereby other "clients" of education, such as employers and senior citizens, will have an impact on the client-based decision-making system.

5. Clusters as Flexible Learning Organizations

Our current educational system is highly resistant to change, so that a crisis is necessary before any significant change can take place. To design an information-age system that would also be highly resistant to change would be to ensure another educational crisis in the not-too-distant future. The LearningSphere 2000 system will be a self-designing "learning organization," where change will be continuous and crises will be minimized. Making change client-based rather than bureaucracy-based will be the most important innovation to accomplish this.

6. Learning Centers

The guide and her students will have access to various learning centers, as well as specialists in other settings. A learning center will provide instruction in a *focus area*. It might be a traditional, discipline-oriented area such as biology, a cross-disciplinary, thematic area such as pollution or cities, an intellectual area such as philosophy, or a technical area such as automobile maintenance and repair. In all cases, centers will incorporate instruction on other higher-order skills into the focus-area instruction, and the cluster guide will be responsible for helping the student put together a program of study that represents a good progression of such higher-order skills instruction.

Learning centers will usually operate independently of the clusters. Every few months all children will receive a certain number of *passes* that will entitle them to use of the learning centers; additional passes can be earned. As a general rule, the older the child, the more she will use the centers. The learning centers' budgets will be based on the number of students served (the number of passes collected), so there will be considerable incentive to attract students and satisfy cluster guides' needs. Again, there will be a combination of competition among centers and cooperation within a center.

We currently envision three types of learning centers: mobile centers, community centers, and "shopping mall" centers. The *mobile centers* will be centers on wheels that travel around from one cluster to another and even from one community to another. They will be found mostly in low-population areas and for high-technology applications. *Community learning centers* will be located in community settings, such as museums and businesses. These centers will provide extra income and tax breaks for their sponsors, and will offer students important learning resources in real-world settings. The "*shopping mall*" centers will be centrally located facilities ranging from one-person "craft shop" operations to regional or national chains. As in retail businesses, the client-driven system will pressure centers to adjust their offerings to meet changing

needs. Therefore, we can anticipate that centers will spring up and die off on a regular basis.

Cooperative arrangements will be made so children may use centers located in other school districts. Learning centers will be staffed by certified teachers, technical and creative people, and parents and community members as volunteers. "Shopping mall" learning centers will offer powerful learning environments that incorporate a range of resources, from hands-on materials to multimedia learning environments.

7. Learning Contracts

Learning contracts will serve a planning and monitoring function. The parent(s), teacher, and student will meet on a regular basis (perhaps every three months) to establish a contract (plan) for the next period and to review the student's accomplishments on the previous contract. The parents and student will have considerable input to specify what the goals and outcomes will be in the contract, but the teacher, the community, the state, and even the nation will all have the right and obligation to assure (through assessment mechanisms; see Section 11) that appropriate standards are being met. The means to attain the goals will also be discussed, with the parents and teacher assuming certain roles in support of the student's efforts.

Only through this kind of collaborative team approach will we overcome many of the obstacles to learning in some home environments. A computer-management system will help the teacher, student, and parent(s) to prepare the contract and to keep abreast of the student's progress. And a locally administered, computer-assisted, attainment-based (performance-based) assessment system will help to keep track of the learner's progress, as well as to compare the effectiveness of the instructional methods, the learning centers, and the clusters.

8. Developmental Levels

The first level of development in the LearningSphere 2000 system will begin at birth. This will help *all* students get a head start. The learning at this level will occur either at home through parents or siblings (with possible guidance from a guide), or in a "home room" as a day-care option (with young assistants under the direction of a guide).

The second level of development will begin at about age 3, as the Montessori system does, and the guides will be similar to Montessori teachers in many ways. Most of the learning will occur in a "home room," where the guide introduces the children to well-designed resources as the children become ready for them. Caring guides and

assistants will have high expectations and will nurture the full, well-rounded development of their students in cooperation with the parents.

On the opposite extreme, in Level 5, which will begin about age 14, the cluster facility will be more of a conference room than a home room and activity room. Most content learning will occur in the learning centers, including center-sponsored seminars, projects, and tutoring sessions, and students will tend to work in small groups in the centers. Intellectual scavenger hunts entailing interdisciplinary problem solving will be widely used. The guide will also work on developing the student's attitudes, values, and ethics, such as honesty, the work ethic, responsibility, initiative, and conscientiousness. Service projects will be required of students often. The guide will work closely with the parents on such other concerns as the child's emotional, social, creative, and psychological development. This will entail (1) identifying with the parents any aspects of development that need work or any obstacles to further development that need to be overcome, and (2) developing with the parents an appropriate plan that entails certain parental actions, as well as certain guide actions of which the parents approve.

Levels 3 and 4 represent intermediate stages or combinations of the activities described above.

9. Children with Special Needs

The LearningSphere 2000 system will accommodate children with special needs in the very fabric of its design. In the LearningSphere system, **all children will be special**. Education will be personalized for all children; all children will be closely monitored for progress and will get the emotional attention that they deserve. Special-needs children will require this kind of attention and will be integrated fully into the system. Financial incentives will be offered to clusters to recruit special-needs children, and some guides will receive special training for meeting different kinds of special needs.

10. Curriculum in the LearningSphere 2000 System

Recognizing that dramatic changes in the workplace have important implications for curriculum, the U.S. Department of Labor prepared the SCANS (the Secretary's Commission on Achieving Necessary Skills) Report for America 2000. The report recommended that the curriculum should include:

- basic skills, including the ability to read, write, perform mathematical operations, and listen and speak effectively;
- thinking skills, including ability to think creatively, make decisions, solve problems, and visualize;

- personal qualities, including responsibility, self-esteem, good interpersonal skills, self-management, and integrity; and
- five broad competencies: use of resources, information, technology, interpersonal skills, and systems thinking.

The LearningSphere system also seeks to foster all aspects of the human development, including what Banathy (see references in his chapter in this book) refers to as the socio-cultural, ethical, moral, physical/mental/spiritual wellness, economic, political, scientific/technological, and the aesthetic.

The objective of LearningSphere 2000 will be to develop people capable of using appropriate technology for their work, with historical and contextual knowledge to make them good citizens of both their country and a global society. They must also be able to continue their learning throughout their lives. The curriculum therefore will provide a solid understanding of knowledge in the core curricular areas and the ability to apply that knowledge to real-life problems and situations. Many of the target understandings and skills will be the same for every student, but personal learning plans and variety among learning situations will provide different means of attaining the same ends.

Work is currently underway to make curriculum more relevant to the needs of the information age, and present and future work will be regularly used to improve the LearningSphere curriculum. Since understanding the world around us will be a particularly important part of the curriculum, we offer the following brief summary of characteristics for science curriculum:

- It will be interdisciplinary; concerned with processes, phenomena, and concepts, and, where appropriate, integrated.
- It will present science, first phenomenologically and descriptively, then empirically and semi-quantitatively, and finally theoretically.
- It will be related to experience and evidence, rather than assertions, and it will encourage students to pose questions about the natural world and to acquire evidence to formulate answers to those questions.
- It will be related to other broad areas of human knowledge and experience, such as history, philosophy, and literature, and will have relevance to students' lives.
- It will seek to provide students with a depth of understanding, rather than an encyclopedic knowledge, so that science concepts can be fruitfully applied to new situations.

11. Assessing Student Outcomes

A variety of companies will produce competing assessment instruments calibrated to national and state standards. The individual

clusters and the community will review and utilize what they consider to be the most appropriate of these assessments, and will develop their own assessments as needed to fill in any gaps. The purpose of these assessments will be to certify attainments, not to compare students, and all students will be expected to reach a passing standard. Hence, they will not be monolithic; a student may be assessed on a single competency or attainment, rather than a large number of them all at once, and she may request the assessment when she feels she is ready for it, rather than having to take it at a predetermined time.

Students' progress will be assessed in two ways: (1) separately, in the academic disciplines, and (2) across the disciplines in a series of real-world projects. This approach will have two important advantages. First, although disciplinary boundaries will certainly be looser than in the current system, concentrated attention to a subject (e.g., mathematics or literature) will permit solid understanding of the essentials. Second, allowing students to demonstrate competence in multiple modes will provide a more accurate picture of their strengths and weaknesses.

For both disciplinary and interdisciplinary assessments, the guide will not be a "judge" who serves as a perceived obstacle to the student's progress, but a "coach" who helps the student surmount an external obstacle. With the support of learning centers, the guide's duty will be to prepare students for the two kinds of system-wide assessments. They may wish to design interim examinations to be administered at a single site or in a cluster of sites, or they may use the examinations from former years for practice. The selection of learning tasks and instructional strategies will be made by the guides who are ultimately responsible for their students' performance.

12. New Roles for Technology

Technology will play central roles in teaching, assessment, and keeping track of learner progress in LearningSphere 2000. Computer-based simulations will be excellent tools for modeling the real-world, authentic tasks, and for maximizing active involvement and construction of learning. Multimedia systems will integrate computers and interactive video. Hypermedia, especially, will be important tools both for managing diverse resources and for supporting authentic learning activities. Such media will allow the student to pace himself and spend as much time as needed to master particular learning objectives. They will also be more dynamic in aural and visual modes, thus accommodating a greater variety of learning styles. Electronic networks will connect students and teachers across geographic and cultural boundaries for a greatly enriched learning environment. Using distance education, many different kinds of media will serve unique needs,

including staff development, especially in rural areas. Learning resources will frequently be designed for several students to use at a time.

Guides will be able to design and produce instructional materials themselves with computer-based authoring systems, desktop publishing, and other developer tools. Guides will also have much greater access to furthering their own learning with the richness and variety of materials available.

Computer technology will facilitate assessing mastery of educational objectives and will alleviate the drudgery of record-keeping. Computerized adaptive tests have been shown to be accurate and time-saving for assessing student mastery of learning objectives when attainment of those objectives can be realistically evaluated by computers. Such tests will be taken individually whenever a student is ready, they will usually be very short, they will be repeated as needed without burdening a teacher for evaluation and feedback, and results will be fed automatically by computer network to a central database which will be provided by the administrative support system. Thus, advanced technology will significantly reduce the amount of student and teacher time devoted to carrying out assessment activities.

This centralized system will help the teacher, student, and parent(s) prepare the contract and keep abreast of the student's progress. It will also analyze the effectiveness of the instructional methods, the learning centers, and the clusters. Aggregate measures of each cluster's performance (in terms of student mastery of objectives) will be prepared automatically and will be available as "consumer reports" to parents and their children. Similar measures of each center's performance will be prepared automatically for cluster guides.

13. Administration of the LearningSphere 2000 System

A district-wide administrative system will facilitate the efforts of the clusters and learning centers. It will be a very different paradigm of administration than that which characterizes our industrial-age system. The **Cluster Support System** will manage the incubation of new clusters and provide support services to existing clusters (budget management, purchasing, custodial, transportation, etc., many of which will be contracted out to private contractors). The **Learning Center Support System** will serve the same function for the learning centers. Clusters and learning centers may opt out of these services and find others better able to serve their needs. The **Consumer Aid Agency** will serve as a placement counseling service for matching children with guides, and as a watchdog service for collecting and disseminating information about the quality of performance of the clusters, guides, learning centers, and support systems.

14. Governance of the LearningSphere 2000 System

There will be important differences from the current system on both the community and state levels of governance. Local school boards will not micro-manage the affairs of the educational system. Their purpose will no longer be to control the system, for the consumer-driven decision-making system will assume that function. Boards will facilitate the efforts of the individual units (clusters, learning centers, and other support units), and will set and monitor the attainment of community standards. Furthermore, there will be a community-elected Citizen Review Board. It will be entrusted with the authority to adjudicate disputes among stakeholders (e.g., clusters, learning centers, parents, students) and protect the rights of the disadvantaged. It will also govern the affairs of the Consumer Aid Agency.

On the state level, again, the purpose of the state departments of education will not be to micro-manage the local systems. Rather than dictating means, they will set standards (outcomes) and monitor their attainment. They will use incentive systems and contingencies to correct any deficiencies in meeting high standards. They will also serve a support role and a financial equity role with an equitable revenue collection and distribution system. And there will be a state-level Citizen Review Board for cases that the community Citizen Review Board cannot resolve.

15. Relationship to Other Human Service Systems

To meet the needs of students in the information age, we must think of school systems as systems of learning and human development. This would result in considerable overlap with other human service systems at both the community and state levels. Therefore, the LearningSphere system will integrate services for birth through age-five children and their families, as has been done in the Independence (MO) School District (see the chapter by Caccamo and Levitt in this volume). These services will include health care, family and parent education, contact with the children and parents from birth, child care services and support for working parents, and family literacy efforts.

Health care and family services will be based in the school with case workers and health care workers contacting families and identifying and accessing necessary services in the school. The school will be the one place a majority of families find themselves for an extended period of time. The LearningSphere 2000 system will maximize the opportunities for exploiting that contact to shore up the family's resources and commitment to education, and thus to maximize the experience of children in schools.

16. Cost-Effectiveness

It is often said that if you want to learn something, teach it. Peer tutoring has proven to be a highly effective instructional strategy for the tutor as well as the tutee. Students are perhaps our most underutilized resource in education. Parents, senior citizens, and other volunteers have also been greatly underused. The LearningSphere 2000 System will utilize these human resources greatly, increasing the human dimension of learning while reducing the labor costs of education. Add to this the labor-saving and increasingly cost-effective technologies for learning and the considerable savings from a reduction in the administrative bureaucracy, and the LearningSphere system will increase by an order of magnitude the amount of time learners are actively engaged in learning, at a cost per child comparable to current costs.

A Final Note

This preliminary design has evolved over eight years and is based on accumulated experience and analysis of massive changes currently gripping our society and transforming our complex social systems. Some of these ideas undoubtedly need revision, some are likely to vary from one community to another, and most need further elaboration and operationalization. Nevertheless, this image hopefully provides a useful tool for helping those interested in systemic change to "jump out" of the industrial-age mindset about education, and it may also suggest some features that a new educational system might require to meet our *present* and *future* needs.

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Putting Technology to Work for School Reform

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Introduction

A potential stimulus toward reform in schools is the increasing role of technology in every aspect of life outside schools. Work in the real world of offices, factories, laboratories, hospitals, police stations, and supermarkets is becoming dependent on technology, as working adults increasingly do their reading, writing, and calculating in computer environments (Collins, 1991). In schools, where reading, writing, and calculation are primary activities, it makes sense that there should be a strong tendency to import and press into service the tools of the late 20th Century workplace.

In fact, schools have been resistant to the use of computer and video technology to do useful work, partly for economic reasons (substantial investments are required to make schools truly technology-intensive)—but also because schools are not seen as typical workplaces. As a result, we find that we are educating people to live in the 21st Century with technology from the 19th. If technology is going to enter schools successfully, we need to understand that schools can be places in which students and teachers do meaningful work, of the type that technology can support, in a way that is cost-effective. This implies systemic change in all aspects of school life—in governance, technology, physical structure, curriculum, assessment, and teaching practice.

As part of the New American Schools Development Corporation's initiative for the redesign of American schools (Rundell, this volume), we have been developing and refining a school design concept (called the "cooperative networked educational community of tomorrow" or Co-NECT) based on four integrated components: a project-based curriculum; a "personal growth system" for individualized assessment