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To: Colleagues
From: Robbie McClintock
Subject: Possibilities and Initiatives
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Begin, staccato, with the essentials: here are three questions.

> What cultural resources should the curriculum comprise and why should it comprise them?
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> How should the curriculum present these cultural resources so that students can appropriate them through effective cognitive representations?
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> With what strategies of explanation and assistance can teachers and educational technologies best help students appropriate these cultural resources?

If we answer these questions powerfully, we can deeply affect the quality of education during the coming decades.

Here are two reasons why we have a great opportunity to shape the quality of American education through these questions.

> Educational possibilities rising from a computer-based curriculum will differ significantly from those resting on a print-based curriculum. The educational system will soon undergo massive structural change.
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> By breaking bottlenecks impeding implementation of a computer-based curriculum, the Teachers College community can exert significant leverage over its content and design. We can shape the structural change.

Would you help exert this influence on the future quality of education? To do it, scholars in the humanities, social, and cognitive sciences need to address these three questions systematically, using their answers to shape the electronic curriculum. We have an extraordinary opportunity. Let's grasp it.

Why the educational system will undergo massive structural change.

A computer-based curriculum will significantly differ in its structural characteristics from a print-based curriculum. Print-based curricula consist of sequenced steps up the educational ladder, grade by grade, subject by subject. Specially designed texts package the cultural resources that students should master at each grade through the sequence. Whatever they miss, they miss, unless they fail so egregiously that they must repeat the grade. At the end of each year, students return their books and they most likely will never again consult them. In a cumulative sense, their educations consist of the skills, ideas, and information that persist, after students have left the tools of study behind.

With print materials, the structuring of the curriculum cannot be different. Imagine a tenth-grader who had to stagger to school, dragging all the books she had used from kindergarten onwards. Even if she could tote them all, the logistics of consulting them would be too awkward for their simultaneous presence to be of any use. Here is the structural change: a cumulative, aggregate availability of curriculum materials, so unthinkable in the context of print, will become the natural order of things in a computer-based curriculum.

In the current sequence, students essentially get one try or they are out, out of step at least with the ideal sequence. We see them, by virtue of this sequence, acquiring knowledge. We rarely see, however, that they simultaneously acquire ignorance, boundaries, limitations. "I didn't do well in ... , so I couldn't go on to ... ." Fill in the ellipses. With one or another variation, everyone has such a lament, and usually the reasons for not doing well were adventitious. Able to carry only a small part of the printed tools for study at any one time, the student moves sequentially through the whole system, acquiring some enduring knowledge and some enduring ignorance along the way.

With digital materials, the physical limitations on access to the tools for study are much less stringent. In one, two, or three decades, each student will have immediate, continuous access to the whole curriculum, while in school and throughout life thereafter. A thin foil encased in an ounce or two of plastic now carries information that would weigh 500 pounds or more in books, and the access to any item within is direct and immediate. The physical constraints will keep transforming and very soon the child of tomorrow will have at her finger-tips what in our day would have been, quite literally, "tons of material." But what material? That's where we at Teachers College come in, and it is not an insignificant point of entry.

Such a curriculum will differ significantly from the current set of segregated subjects, each scoped and sequenced and carefully packaged according to grade

level in the old, sequenced system. The particulars of the new, aggregate curriculum are, to significant degrees, particulars that curricular designers must still discover and invent. Certainly it will not be just a vast mass of undifferentiated information -- the Library of Congress and the Smithsonian Institution digitized with a Boolean search engine as a user interface. The new curriculum will need to be scaled to human capacities and interests, and carefully organized. It will consist of something like a greatly extended anthology containing an inclusive, but not exhaustive selection of cultural resources pertaining to the gamut of matters that should be included in "general education," the cultural acquirements of a well-rounded person. Along with each substantive item in the selection, the curriculum will include study aids and assessment tools integral to that item. And all this will have substantive, experiential continuity with contemporary life and culture, but students will appropriate it as an aggregate, not as a sequence.

Whether students will become wiser and more humane by having immediate access from all places at all times to all materials in the curriculum is moot. What is not moot, however, is that this change will profoundly alter the structural conditions of education. We realize that when structural changes in economies occur, they alter long established terms of trade, making and unmaking fortunes. So in this case, structural changes will alter the terms of trade in our profession. We should try to anticipate these structural changes, to think about them, and to act with foresight in anticipation of them. If we anticipate blunderingly, we may find our labors yet further devalued; if we anticipate shrewdly, we may take the lead in the fundamental reform of education and life. Here, blundering or shrewd, are some anticipations that occurred to me.

How Teachers College can influence these changes?

An American tragedy happened when educators lost curriculum control to the publishing industry. Textbooks generated by and for profit amount to pedagogical pabulum: they are causing the American lag in educational achievement. Without concerted influence on the curriculum, schools of education have been lamed and the linkage between research and practice has been broken. Simply stated, the opportunity before us is the opportunity to regain responsibility for the content and organization of the curriculum. Let's do that.

Structural changes resulting from a computer-based curriculum will profoundly alter the terms of trade pertaining to the production of curricular materials. Here are major developments that can be expected to occur, sooner or later, in this process.

First, absolute expenditures for education per student will rise. A computer-based educational system will not be cheaper than the current one, but it will be better. The overriding civic stake is not for economy in

education, but for quality and effectiveness. That has been the overriding civic stake over the past two hundred years and it will continue to be so, intensified by the spreading recognition that improved education is essential to resolving endemic social problems and to maintaining competitiveness in a world where aggregate educational achievement determines, long-term, the relative advantage between competing economies. When it becomes clear that significant improvements in the education of the public can be achieved by increasing educational expenditures and converting to a capital-intensive, digital system, the investment will be made.

Second, the absolute increase will be on the order of an additional 10% of current per student expenditures, creating a new component of cost over and above existing components for plant, salaries, and the like. This market will be highly structured, totalling over $10 billion annually. The main recipients of these expenditures will be the vendors of computers and related hardware, and secondary recipients will be software vendors and communications companies. What will be sold in this market, I am convinced, are school-wide, integrated computer-based curricula, delivered through networked, media computers, in which all materials are available to all students at all times. For an indefinite period, the components of this system may dissolve into the existing curriculum as a diversity of stand-alone curricular elements -- this or that software package, videotape, or disc running on this or that computer, player, or drive. But the real pedagogical gains of these components will not be fully apparent until they crystallize into school-wide systems that students relate to over the whole of their time in school in a way significantly different from their present climb up the curricular ladder.

Third, when that happens, and it will happen soon, historically speaking, the criteria determining the educational quality of curriculum materials will snap through a change. How sound, in a cultural and educational sense, is the selection of materials included? Spencer's great question comes thundering back, What knowledge is of most worth? With respect to the presentation of the material, the degree to which it has been packaged for optimum teachability diminishes in importance. Preparing the material for study by students who will be coming to it from diverse directions will become more important. These are all matters right up our alley. Prentice-Hall and Scott-Foresman may be able to say how much certain selections of knowledge have been worth on their bottom lines, but they would have scant authority in serious debate about the cultural worth of alternative selections of knowledge. Nor will they be good sources of rigorous research on how best to present ideas through diverse media so that they

can be apprehended effectively through processes of study. We, in contrast, can have such authority and can generate such research.

Fourth, the major beneficiaries of the new structure of expenditures are the equipment vendors and they have a double stake in seeking substantial improvements in educational effectiveness. On one side, it happens that the major equipment vendors are huge enterprises highly dependent for their long-term success on the over-all effectiveness of American education. They may have special stakes in the availability of esoteric researchers, but they have, even more, a general stake in the quality of American education at large, needing skilled workers on the line, intelligent clerks in the back offices, an alert sales force, and a corps of imaginative managers. On the other side, the equipment vendors cannot peddle marginal improvements, expecting thereby to build the educational market up to something substantial. They need to demonstrate to a skeptical American public that intensive technology in education will bring dramatic results that merit a substantial increase in total expenditures. Why spend several hundred dollars for a computer and software that is the functional equivalent of a two-dollar workbook? If the vendors cannot implement a computer-based education that significantly outstrips the potentialities of the existing system, they have no profitable place in education. But if they do demonstrate significant new possibilities, they reap the benefits of central participation in a huge new market. Hence, they are a ready audience for a new educational vision. We are the proper source of that vision.

How can we capitalize on such structural changes? We can best do so by organizing a sustained effort to address our three key questions, bringing our unfolding answers to bear on the creation of the computer-based curriculum. Hardware is far in advance of software and software is far in advance of the cultural content available in digital form. Without the cultural content, the educational possibilities of a computer-based curriculum will be severely limited. How significant would automobile transportation be without a system of roads, well-engineered for the purpose, reasonably well-maintained, and supported largely at public expense? The textbook industry hangs like a parasitic vine from the great trunk of printed scholarship and conservation, which is like the road system of the car industry. We have power in the process of change because there now exists a lack of suitable cultural resources with which a computer-based educational system can develop.

Step 1: we need to provide developers of digital curricular materials with a selective repository of quality resources in digital form. We need to make an inclusive, but not exhaustive selection of educative images, text, and audio by pursuing the first question above -- what cultural resources should the curriculum

comprise and why should it comprise them? As we answer that, we can create an archive of digitized resources, clearing the rights for electronic reproduction for educational purposes and availing the whole to curriculum developers at minimal rates, provided they make the whole package accessible through their system.

In doing this, we will not take over the role of the commercial curriculum developers, but we will help ensure that their competition for success in the market place conduces to educational excellence. Left to their own devices, making their own selection of cultural materials and underwriting the costs of preparing those materials for presentation in digital means, the economics of investment force a thin and pallid selection on them. To them, digitizing extensive cultural resources is a burdensome cost complicating their pursuit of profit, a cost that does little to differentiate their product from that of competitors -- it stands to the development and sale of educational software roughly the way road building stands to the development and sale of cars. In contrast to the software developers, who need the cultural materials but will not succeed by virtue of their direct efforts to provide them, the academy exists as an historic institution precisely to make, and ground on reasoned judgment, this sort of selection. We can raise the resources to do the task well, and in doing it well, we will do everyone a service.

Step 2: we need to provide developers of digital curricular materials with quality research about how such materials can best be presented through such systems. We need to learn about the presentation of ideas through electronic systems by pursuing the second question above -- how should the curriculum present the cultural resources of most worth so that students can appropriate them through effective cognitive representations? As we answer that question, we can develop a body of sound knowledge about how electronic media can be used effectively in educational efforts. If we can make such knowledge available to the developers of computer-based curricula, we will do much to reestablish a strong, direct link between research and practice in education..

In doing this, we will not act to displace the commercial curriculum developers, but rather, we will provide them with useful clues about how they can best proceed. Currently, very little knowledge exists about how to make a wide range of cultural materials lucidly accessible through computer-mediated presentations. This lack of knowledge inhibits the development of the computer-based curriculum, for such curricula will be very costly to create, even if we pre-select and digitize at low cost the contents of it. Investors will not put up the needed capital if they have no way of anticipating that their presentation of the material should prove educationally effective. By providing well-researched guidelines on preparing computer-based materials for effective study, we will clear the path for powerful practical initiatives.

Step 3: we need to provide developers of digital curricula with a thorough re-examination of the educational process to understand what dynamics will pertain

when the whole curriculum stands available to all students at all times. We need to learn about these dynamics by pursuing the third question above -- with what strategies of explanation and assistance can teachers and educational technologies best help students appropriate the cultural resources of most worth? As we answer that, we can develop insight into ways of making the new structure of the curriculum best serve the needs of all students, despite the diversities of their background, ability, and interest.

In doing this, we will not be preempting the role of curricular developers, but will instead be providing them with a third necessary service. Uncertainty inhibits practical efforts at innovation, and one source of uncertainty concerns the response of teachers to potential changes. To institute new possibilities, interesting roles for teachers need to be built into the system and means developed through which teachers can master those roles. Without such provisions, it is quite possible that a new system will be killed off, even where it is formally adopted, because teachers will not put it fully into operation. To prepare for the institution of a computer-based curriculum, faculties of education need to develop robust precepts of practice and show that we can impart them to the profession. By doing so, we will make it more probable that potential developers of computer-based curricula can reasonably calculate that if they can implement a new educational structure, the established profession can assimilate it into practice.

Aims such as these are aims, I believe, that a significant group of us can pursue with the sense that in doing so we will be fulfilling our professional potentialities to the full. I am confidant that if we take the internal step of creating an organization and a plan of work, substantial resources will become available to support our efforts.

Toward this end, I propose the formation of three working groups -- on selecting cultural resources, on researching the cognitive representation of them, and on developing precepts of practice pertaining to their study. Each group would be charged with developing a plan of action and a strategy for raising the resources needed to carry out the plan. If you are interested in participating in this initiative, we will be holding a plenary meeting on [April 7th???] at 10 a.m. sharp. At 10:30 the group will break into three working groups, which should work on a preliminary plan and implementation strategy for the remainder of the morning. At 12:30, the whole group will reconvene for lunch and reports from each group outlining their deliberations. Through the remainder of the Spring, the staff of the Institute for Learning Technologies will work with each group to translate plans into funded proposals and initiatives, with the intention that a three-pronged College-wide effort will be vigorously underway with the coming academic-year.