



HIGHLY INTERACTIVE TUTORIAL DISTANCE LEARNING

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Abstract

This commentary argues for a new perspective on distance education – one that is based on advances in interactive learning, rather than one-way delivery that is encouraged too often by the design of web-based courses. Tutorial approaches to education are highly effective and new media can bring critical aspects of tutorial approaches to more students than ever before possible.

Keywords

tutorial, interactive, distance learning, multimedia

Our present educational institutions are at the service of the teacher's goals. The relational structures we need are those which will enable each man to define himself by learning and by contributing to the learning of others.

(Ivan Illich, 1971, *Deschooling Society*, Harper and Row)

. . . the dream [of global educational opportunity for everyone on earth] is impossible if education is visualized as it always has existed in recent centuries: a school-room with a teacher and students . . . an impossible model for world education at the beginning of a new millennium.

. . . we need a completely new plan and vision for worldwide access to education at all levels, if the next century is to see a quantum leap in educational opportunities everywhere.

Obviously, this is a great challenge and no easy task.

(Theodore Hesburgh, 1993, *Looking Forward*,
John Templeton (ed.), New York: HarperCollins)

INTRODUCTION

This paper proposes a new educational system, based primarily on distance learning at all levels of learning. The paradigm for future learning suggested is tutorial learning. The major learning medium for all students will be highly interactive multimedia computer-based learning material allowing us to educate everyone in the world, anywhere and at any time, to the mastery level (Bloom

1973, 1981, 1984; Bloom *et al.* 1981). Peer groups of students will be important; contact with other humans will be encouraged.

All individuals are unique; no two are identical. These learning experiences would be optimized to the needs of each student, exploring individual problems and offering tailored help. I begin this paper with visions for the future.

VISIONS OF LEARNING

Everyone on earth should learn, lifelong, everywhere and at any time. Everyone should learn well. Learning should emphasize higher cognitive skills, problem solving and intuition. Learning should foster love of learning. We want creative happy individuals who can live peacefully with others. The cost of learning should be affordable to all, for individuals, regions and the world. We need a global learning society.

LEARNING PARADIGMS

Most learning in human history has been viewed as a process of acquiring information. Typically in a class, or in other learning situations, information is 'transferred' to the student. A better paradigm for the future is tutorial learning. A highly interactive dialogue – a learning conversation – takes place with a student, or a very small group of students, and a skilled tutor. The student may work in a laboratory or solve problems.

Such a personalized interaction has been impossible for large numbers because of expense and the small number of skilled tutors. But highly interactive technology makes tutorial learning possible for all, if appropriate computer-based learning units are developed and made widely available (Bork 1999, 2000a, 2000b, in press).¹

FEATURES OF THE NEW SYSTEM

The basis of the new system will be highly interactive tutorial computer-based learning modules, used through distance learning. The emphasis is on lifelong learning, from early childhood to old age, not just schools, universities and training programmes within companies. All students will master the material.

ZONE OF PROXIMAL DEVELOPMENT

At each point the learning units will determine what should happen next for the student, as with Vygotsky's idea of the zone of proximal development. Two things make this possible in computer-based learning: frequent high quality two-way

student-computer interaction and long-term storage of student records. Designers are responsible for these factors.

The programs will resemble a conversation, a dialogue, between a student and a human tutor. Programs will ask questions in the student's native language, and respond to free-form student input, in the Socratic tradition. Multiple choice and pointing will not be used, as they do not allow for full individualization of learning. Simulations may be part of the learning materials. The computer can also reply to student questions within a context. The computer will frequently store information about the learner, problems and successes. These records will be used frequently within the programs. When a student returns, the computer knows where to begin the new session. Information about learning styles will be stored.

Voice input, a natural interaction mode for humans, will probably be used. New voice input systems from several companies are effective and inexpensive, and can be speaker independent in the highly interactive learning environment. Keyboards will be unnecessary, except for users addicted to the keyboard.

NEW LEARNING TOPICS

All materials can be directed toward encouraging everyone to live happily with other people, increasing problem solving, intuition building and encouraging creativity. Learning will consider major world problems.

PRODUCTION OF TUTORIAL LEARNING UNITS

Most existing systems for generating learning software do not give major priority to highly interactive tutorial units. So when we first pursued this goal 30 years ago at the University of California, Irvine, we began to develop a system for this activity. About ten years ago Bernard Levrat and Bertrand Ibrahim of the University of Geneva joined us in this development, so we refer to this system as the Irvine-Geneva system (Bork *et al.* 1992). A major emphasis is on analysing free-form natural language input. We do not use tactics from artificial intelligence, although they may eventually prove useful for this purpose.

We consider four stages in the development process; all steps are about equal in costs. The first, not discussed further, is project management. The second, design, is the most important activity if we are to generate high quality tutorial units. All the details must be described at this time. The key people in design are very good teachers in the area, in groups of about four. They identify student problems likely at each point of the interaction, decide how to identify these problems, and decide what help is necessary for the individual student. The

teachers formulate the questions asked of the students, and make all decisions about analysing student input in design sessions. They pool their experiences with students. We combine learning and assessment as one continuous process; assessment is used to determine what learning material follows.

The third stage is implementation. Our script editor can write some of the program, from the stored design, but human coding will be required. Specialists in the area create media mentioned in the design.

The last stage is formative and summative evaluation, improving the learning units and comparing their effectiveness with other ways of learning. Typical students use the material, often showing problems with the initial design. These are corrected. Several stages are used. Much of the data is stored online as students use the programs.

DISTANCE LEARNING

Some use of the materials might be in existing institutions, but for learning to be available for everyone on earth, distance learning is essential. 'Distance learning' has a variety of usage, not all consistent with this vision. In the USA, distance learning often means about 25 or 30 students at a location different than the teacher or professor, too few for our visions. Information transfer is the paradigm.

One view of distance learning is to produce a video of a lecture, at several levels of video expertise. Stanford University did this, starting with engineering courses for companies in the area. This was the approach of the Chinese TV University, perhaps the largest university in the world. The learning paradigm is information transfer. Even when e-mail, chat rooms and websites are added, the learning paradigm is not fundamentally different.

Distance learning based on highly interactive tutorial computer-based learning modules can reach very large numbers of people. Since most students will not be in formal institutions, and will be without teachers, learning units must be intrinsically motivating and react to the individual needs of each student. We will seek the cheapest distribution method. Initially CD-ROM and the Internet are likely modes. Distribution will probably eventually be by satellite.

COSTS

Although development cost for this learning material will be high, the critical cost, an hour of student learning time, will be low. As with the UK's Open University, very large numbers of students will use the interactive learning

materials. So the cost per student, including development and delivery will be much less than for current systems.

The learning units will be eventually available in many languages. This will further increase the size of the market, and so reduce the cost for each student. The marketing of the units in developed countries could support the distribution to poor areas.

NEXT STEPS

The following steps are suggested:

- There is little computer-based tutorial material available. We need major experiments to attain an empirical basis for future development. We must develop many extensive units and conduct professional evaluations with many students. International experiments would be desirable.
- If the experiments are successful, we need to plan and carry out the major activity of creating the large amount of learning material needed. Major initial funding will be needed but eventually the activity can be self-supporting, even profitable. We can expect the cost for each student hour to decline.
- New organizational structures for tutorial learning will be required. These organizations should be based on the new learning paradigm and must be capable of supporting very large numbers of students. We should consider how to keep very useful features of current organizations.
- We need continuing development of new curriculum material. This includes learning units replacing already developed modules.

NOTES

1. Further references can be found under papers at: <http://www.ics.uci.edu/~bork>

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