Presentation 3

Virtual Universities and the Research-Centered Curriculum

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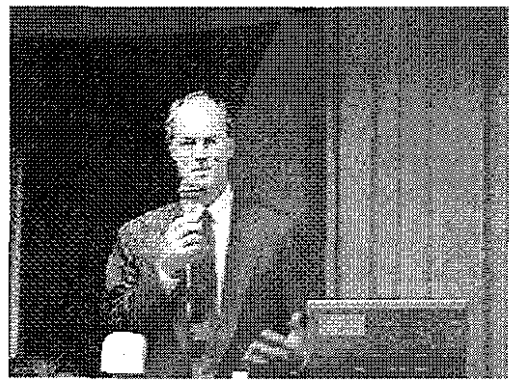

Good afternoon. I would first like to join my colleagues in expressing thanks to Prof. Araki, Prof. Tanaka, Prof. Oyama, the staff of the Research Center for Higher Education in Kyoto University, which has taken such good care of us. I think there is no country that is as hospitable and that takes such good care of its visitors as Japan.

Here in Kyoto we visitors certainly have much for which to be grateful—not only the wonderful "aki-bare" weather, but also an atmosphere of intellectual liveliness and inquiry from which I hope we will all be able to profit. We visitors are here, of course, to offer our views on an important topic of mutual interest. But I am also looking forward to learning the views of our Kyodai hosts and of other Japanese participants as well, particularly during the question period. So thank you again for offering us this opportunity to be with you here.

As you know, in the United States as well as other parts of the industrial world, there have been two major trends in higher education during the past quarter century that are often thought of as parallel and mutually supportive. One of these trends is generally termed "instructional technology"—a broad umbrella concept that includes everything from e-mail, to course web sites, computer software for classes, self-paced learning, and, of course, the kind of distance-learning technology that enabled Prof. Tanaka to ask us to answer the provocative question: "Is the virtual university the future?"

During this same quarter century we have seen the emergence of a new paradigm in the philosophy of education that also goes under a number of names, including "active learning," "constructivism," and "learner-centered education." We have been moving from a concept of education as the transmission of knowledge toward a more dynamic concept, where the students are involved in investigation and creation of insights. The origins of

this paradigm shift lie at least two hundred years in the past, at least as far back as Wilhelm von Humboldt, sometimes thought to be the father of the modern university. Humboldt was a Prussian patriot in the days of the Napoleonic Wars, when it was difficult in Germany to think of a great future for their country. Yet he was brave enough not only to think of the university as a crucial engine for recreating a viable state, but also to think of teachers and students as potential partners.

Humboldt drew a clear distinction between education from childhood through the end of high school, which concerned itself with the transmission of already acquired knowledge, and the kind of education that would occur in the university, where teachers and students worked together. They would be working to enlarge the frontiers of knowledge. In fact, the research university, as the name suggests, has as one of its particular roles the creation of new knowledge. We can argue how much the research model can be applied to teaching students at the beginning of their studies. Nevertheless, Humboldt's vision of collaborative work between students and teachers continues to inspire the paradigm of "active learning."

Instructional technology has gone through a number of phases in the United States since it began to be introduced back in the 1970s. Its first introduction came just at the end of a period when the dominant model of learning in the realm of cognitive psychology was the model we term "behaviorism," and whose chief advocates included the Harvard professor B.F. Skinner. The behaviorist model assumed that people learned on the basis of rewards and reinforcement—repeating routines many times until they became fully assimilated. The assumptions of the behaviorist model fit the capabilities of early instructional technology extremely well. Typically, a student would sit in front of a computer console and answer multiple-choice questions, receiving continuous feedback on which answers were correct, gradually increasing the number of correct responses until he or she achieved mastery of a fixed, relatively narrow set of tasks.

One example of such self-paced computer instruction is language learning. A student can practice French irregular verbs as often as they need in order to remember that that the past participle of "rompre" ("to break off") is not "rompé" but "rompu." I also remember one very good program from the early 1980s that helped students understand the Peace of Paris of 1919, which is both an essential milestone in the diplomatic history of 20th-century Europe and a complex series of often boring treaties. This particular piece of software rewarded students for memorizing the principal articles of all the separate treaties—Treaties of Neuilly, Trianon, Versailles, and so forth. Early models of IT were designed to promote learning at your own pace—individual learning of a kind that depends heavily on memorization.

However, this early experience and the rather successful experience of the marriage between instructional technology and theories of learning subsequently came under

increasing strain as theories of learning have evolved away from the behaviorist model and toward the active learning paradigm that I am sure is familiar to most of you. Despite its familiarity, however, I think it is worth revisiting the theory for a moment and contrasting it with its predecessors, behaviorism and transmission.

Behaviorism assumes that what is learned is fixed, not open to question, and that the goal of teaching is to pass information or behaviors from teacher to student. The new learning paradigm stresses not transmission but construction—that is, trying to create one's one own understanding rather than appropriating someone else's (the teacher's). Thinking of learning as something that is intrinsically interesting, like solving puzzles, getting students to collaborate together, something that relies on group work as well as on individual work, that aims at—and I think this is probably its most important characteristic—conceptual understanding instead of memorization.

This shift from transmission to active learning models was prompted by data suggesting that learning under the old model was superficial and incomplete. In the last 20 years in the United States there have been a number of studies, proceeding initially from the realm of physics, indicating that some students who did very well in their examinations and who received very high grades in one science course were still unable to use the knowledge they had presumably gained when they moved on to the next course in the sequence. For example, they might take a course in multivariate calculus, or a course in elementary Newtonian mechanics. And the next semester they would enter a course that presupposed that they knew how to use multivariate calculus or Newtonian mechanics. And yet they were unable to recall Newton's laws of motion, or to explain the concepts of force or momentum. How was this possible? Had they learned nothing? No, not nothing; what they had learned in fact was how to get good grades in the previous course where they had studied.

This phenomenon was first identified by a professor of physics at Arizona State University who needed to determine the degree of preparedness of transfer students entering his course from other universities. These students would tell him "we have taken advanced courses in our previous university," and that was true. Yet when he gave them a placement examination that stressed conceptual understanding, they scored very badly. One day he decided to give his own students—those who had taken his own advanced course—the same placement examination, and to his astonishment they did just as badly. Clearly they had not grasped the deeper content of the course, even though they had done well on his examinations. Thus more accurate measurements of learning yielded the unsettling finding that genuine learning was not taking place.

Now this may be simply a commentary on the rather weak state of science teaching in the United States. But during the 1970s a number of people outside the United States also began contrasting the mimetic or memorizing approach to knowledge with an

alternative approach where you genuinely understand concepts—the contrast between "surface" and "deep" learning, as it was labeled by researchers at the University of Gothenburg in Sweden in the 1970s. Deep learning, where the student genuinely understand the underlying concepts of the field he or she is studying, is increasingly seen as the most important kind of learning one can do because it permits that knowledge to be transferred and applied.

Now let me pause for a moment and, if I am able to use the technology correctly, I will show you an example of some students at Harvard using the new paradigm of learning:

(Video starts playing)

This is a Harvard class in celestial navigation—one of the oldest continuously offered courses at Harvard in terms of subject matter, and at the same time one of the most modern in terms of technique. In this class students learn how to sail using the stars to determine their location. And yet one of the interesting things about this particular kind of teaching is that the teacher is still very important.

As you can see in the video, the students are collaborating actively in solving problems. The professor divides the students into groups, gives each group a globe and a particular problem to solve, and then moves from group to group. He helps students when they have difficulty and challenges them to go further when they are able to solve the problem right away. So collaboration takes place among the students on the one hand, working in a group, and between the professor and all the students on the other hand. In the United States, as you know, there is no national system of education, so that students often have very different levels of knowledge when they arrive at the university. Such collaboration allows for a great deal of educational flexibility, and I will come back to this theme at the end of my talk. We need to ask ourselves the degree to which flexibility can more generally be built into virtual universities, since that—at least in my judgment—is one of the keys to successful education and successful learning.

Now it seems to me that the challenge for the virtual university is to adapt the strengths of instructional technology to the requirements of active, constructivist learning. Here one of the difficulties we encounter is how to preserve the learning group. You will notice from the video clip I just showed that the students are consulting and talking to one another directly. Not only that, they have their hands on the inflatable globe and are trying to measure navigational distances together. We can observe a great deal of interaction in this professor's classroom, and that is one of the things that makes his teaching so successful.

One of the things we have discovered about the virtual classroom, however, it that group dynamics may suffer. There is unavoidably less shared information and less group interaction, at least given the current state of distance learning in virtual classrooms in the United States. For one thing, not all members of the group participate equally. It is much easier to hold back and let others take the lead if you are sitting in front of a monitor with a microphone in front of you rather than sitting around a table with six other students and an inflatable globe in front of you, trying to figure out exactly where your position is through celestial navigation. So if we expect students to have to work together in order to learn, then group participation needs to remain strong. And that is not always facilitated by current instructional technology.

The decrease in shared information that occurs through distance learning, as the entire classroom experience is channeled through an electronic conduit, raises another issue, which is maintaining student interest and motivation. Even a large lecture course can provide students with opportunities to ask questions or to participate in lecture demonstrations. Distance learning needs to maintain an equal if not greater level of stimulation, lest it become a simple "talking head" exercise where the student sits and watches the professor lecturing, just as we sit and watch a newscaster on the nightly television news.

One further issue we need to address is the faculty need for additional training in order to succeed in using IT, especially in distance learning. As the director of a teaching center I have a certain professional interest in the development of teaching skills. And I think that whatever technological apparatus one has, one has also to consider that success is going to depend not only on the instructional technology in place but also on the qualities of the people using it. Of course there are some faculty who remain suspicious of new technology and will never feel truly comfortable with it. But we should also recognize that this is a very challenging form of teaching that we are asking even willing, interested faculty to engage in—faculty for whom lack of time is often an overriding concern.

To teach well at a distance requires a great deal of effort, a great deal of forethought and planning. At many research universities—and I am ashamed to say that Harvard is an example of this phenomenon—professors do not devote as much time as they should to teaching. Under the best of circumstances, they are absorbed by the demands of the laboratory, the demands of their research. And yet the virtual university requires them to devote more time to preparation, more time to train, at least initially, in order to function comfortably and competently in this new kind of classroom. There may be cost savings down the road through the more efficient use of faculty resources, but in the short run greater effort is required simply to maintain, not to enhance the quality of education offered through distance learning.

Now there certainly exist solutions to at least some of these issues. It is possible, for

example, to keep students from becoming bored by the use of enhanced visual design, as is currently occurring at the University of the Americas in Puebla, Mexico. One thing that the virtual university and distance learning do particularly well is to deliver visual information. In order to combat boredom you can thus make frequent shifts from one kind of media to another. You can display data or graphics, show a map, highlight essential concepts with a PowerPoint slide, or do as I did just now when I interrupted my own lecture with a video clip, hoping to keep *you* from becoming bored. You can even, in some instances, actually write on or annotate your own online visuals in real time. And of course you can make materials available at a remote site or sites. If you were teaching celestial navigation online, you might supply each of the students with an inflatable globe of their own, then have them inflate it and ask them to look at it on their own so at least they might have some kind of tangible, hands-on experience even though they are receiving instruction online.

Is it possible to preserve healthy group dynamics in a distance-learning environment? Here I think the evidence is mixed. It appears that a so-called "hybrid" system of distance education— one that allows students some face-to-face contact with the instructor, preferably at the start of the semester—is superior to a system where instructor and students never have contact with one another except online. In the absence of direct contact, students and instructor tend to invent and speculate about other members of the learning group. In other words, they create a persona for themselves and for others in the absence of face-to-face contact, much as happens with online chat in the world of networked social relations. So there is a pressing need, at least in my judgment, for efforts to bridge the gap between participants and give the learning group increased cohesion in the virtual university.

To return to the provocative question that Prof. Tanaka raised at the outset of our session, is the virtual university our future? In his reply to the question, Prof. Kempner noted that to answer this question, we must first specify what we are trying to accomplish. Why create a virtual university? In order to improve the quality of learning? In order to reach a larger number of students? Perhaps because we wish appear modern and at the cutting edge of pedagogy— certainly one motivating factor in the United States and Mexico?

Computers, campus networking, and the virtual university can serve as visible symbols of modernity. It is very easy to count the number of computers on campus and to state that we have a computer in every classroom and even in the student restaurant. That sounds excellent. But I think as academics we should be asking: what is the educational substance behind these numbers? What the substance is will depend on what we want to achieve.

I have already suggested that there is a historical but not necessarily a logical

connection between instructional technology on the one hand and the new paradigm of teaching on the other. They arose simultaneously in the 1970s, but they are not necessarily interdependent. In fact, as the example in my video clip indicates, successful interactive teaching need depend on technology at all. It can be achieved simply with an inflatable rubber globe and a teacher who is willing to work in an unconventional way, moving from group to group, asking and answering questions.

In conclusion, let me further suggest that one of the ways to think about the issue of the virtual university is to focus on the relationship between ends and means. From my perspective—as the representative of a very privileged university in the United States, much as Kyodai is one of the privileged research universities in Japan—the quality of learning remains a crucial end. If that is our end, then we have to ask, what means can best help us to achieve it? The virtual university is itself a tool, not an end in itself but a means to try to teach other goals. And if better learning is that goal, then we should ask how the virtual university will enhance student learning beyond what it is today. To say that the virtual university is or is not our future should not simply reflect our judgment on inevitable trends in higher education. These trends reflect choices—our choices. Our answer to this provocative question thus revolves around the issue of what instructional technology allows us to do in pursuit of our existing educational goals.

I believe that there are ways in which the virtual university fits the old teaching paradigm much more comfortably than the new one. It allows the professor to stand up and lecture to a far larger audience than before. If transmission is what we are after, then particularly with the growth of bandwidth and the increasing sophistication of distance learning technology, transmission is enhanced a hundredfold. In that sense it is a variant of television, and goals and technology complement each other just as they did in the days of behaviorism and self-paced computer learning a quarter century ago.

However, I continue to have serious reservations—and I believe in this instance I am echoing my colleagues, Prof. Kempner and Prof. Ramirez—about the way in which the virtual university and the kind of visual technologies it employs can be made to fit with our modern teaching paradigm of active learning or constructivism. Of course there are instances where they can do good things. For instance, we also have an adult education program at Harvard, which makes broad use of distance learning and instructional technology. But it is a far greater challenge to fit the technological underpinnings of the virtual university to the conception of active learning, which attempts to promote deep understanding rather than surface understanding. This offers a far more difficult challenge than to fit the virtual university and its informational technology to a more traditional, teacher-centered paradigm.

Why is this so? In part because the number of actors involved in the

teaching-learning process has increased markedly. As soon as you begin to have a learner-centered classroom where all the students are important players, the challenge of including them increases in obvious ways. You multiply the number of required transmission channels by the number of students; instead of having a single person speaking and looking into the camera, you suddenly need to have many cameras, many microphones. In addition, to make a class discussion come alive requires an ability to detect small, subtle hints of body language or intonation. So it is not only the number of actors, but also the quality of their interaction that IT must adequately address if it is to serve as an appropriate tool for active learning.

My conclusion is that there is a great deal of work that needs to be done to make the fit between instructional technology and the learner-centered classroom occur in a productive way, since there is no necessary connection between these two. It may very well be that there are important uses for the virtual university, for instance if we have large numbers of students who live very far away from the university campus, or if there is a need for collaboration between different universities. In that case, distance learning fulfills an important need. But as Prof. Ramirez noted, we should remember the hopes that were pinned on television in the 1950s, not to mention the hopes that were pinned on video in the 1970s. Neither revolutionized instruction as predicted. This does not mean that the capabilities offered by either television or video is not helpful. My teaching center at Harvard makes extensive use of video for training classroom instructors; we videotape more than 200 classes every year. I think of it as a very important tool, but if somebody took away the video cameras tomorrow we would still be able to do our job.

The question "is the virtual university our future" implies a wholesale replacement of the present, face-to-face mode of instruction with distance learning, or at the very least an admission of their equivalence. At the present stage of technology I do not believe they are equivalent, and therefore cannot easily imagine such a wholesale replacement that would not seriously damage the quality of instruction within the university. On the other hand, I can readily imagine a supportive role played by IT as a tool in ways analogous to television or video, which are, in their ways, early examples of instructional technology. Rapid feedback by students on a professor's lecture via e-mail can enable him to reshape his next in-class presentation to reflect more accurately the learning needs of the students is an example of such "hybrid" use of IT. So is "distance research," in which medical students might interview patients or anthropology students interview the inhabitants of a distant city.

Indeed, we are only just beginning to imagine the productive uses to which IT can be put as a tool that enhances the idea of research and learning as a collaborative effort between teacher and students. Wilhelm von Humboldt had as his vision of such collaboration in 1810, but it still seems to me a viable, valid goal. The university is one of

the places that generate knowledge as well as simply transmitting it. It should be an arena in which the students are integrated into the search for knowledge and are in effect inducted into the group of intellectual sand researchers who understand how one learns, particularly since we all know learning is undergoing continuous change.

Within such a university, instructional technology has an important role to play. But it should be the role of an effective tool, not something appears looks modern but in fact hides a much more traditional—and, from my perspective—a much less effective form of teaching behind a technological veneer. Like other forms of teaching and learning, it should also be subject to continuous evaluation, so that we avoid the situation of those American physics students who appeared to be learning when in fact they were only memorizing. If IT can aid in these tasks, then perhaps we can say, not that the virtual university is the future, but that the future of the university is deep learning—aided, wherever appropriate, by instructional technology.

Thank you very much.

Virtual Universities and the Research-Centered Curriculum

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Twenty-Year Trends in American Higher Education

1. Instructional Technology ⏩ Virtual University
2. Transmission of knowledge ⏩ construction of knowledge

Early Models of IT

1. Behaviorist assumptions: rewards and reinforcement
2. Self-paced learning
3. Memorization

Early Models of IT

1. Behaviorist assumptions: rewards and reinforcement
2. Self-paced learning
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New Paradigm of Learning

1. Construction not transmission
2. Intrinsic as well as extrinsic rewards
3. Group work
4. Conceptual understanding instead of memorization

Problems with IT in New Setting

1. Group dynamics suffer
2. Uneven group participation
3. Increased need for faculty training

Solutions

1. Enhanced visual design
2. Frequent shifts
3. Online annotation
4. Materials available at remote site

Interaction

1. What is the group experience?
2. Does distance learning promote group inquiry?
3. Is it equivalent to face-to-face interaction?

Is VU the Future?

1. What is our goal?

Is VU the Future?

1. What is our goal?
2. Historical, not logical connection

Ends and Means

1. Better learning is the goal

Ends and Means

1. Better learning is the goal
2. VU is a tool

Ends and Means

1. Better learning is the goal
2. VU is a tool
3. Teaching skills an important variable

Ends and Means

Key to learning is not resources per se, but how teachers and students USE resources

	OLD	NEW
Study	Teacher-centered	Learner-centered
VU	Fits the teaching paradigm	Restricts the teaching paradigm

Conclusion

VU best adapted to traditional teaching, less well suited for new teaching paradigm