A Systems Approach to the Future of Distance Education in Colleges and Universities: Research, Development, and Implementation

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INTRODUCTION

In recent years, there has been a tremendous increase in the popularity of distance education among higher-education administrators. Students in growing numbers are also taking advantage of the flexibility and accessibility that distance education offers. This growth, however, has been a mixed blessing since it derives from using the Internet without fully taking advantage of personalized instruction and learning that the telecommunication and computer nexus offers. Thus, many institutions are disregarding the most valuable aspect of digital technologies in education.

In most cases, colleges and universities offer a one-size-fits-all curriculum through information and communication technologies. This model of curriculum is a relic of the industrial era when standardization of products and services was highly valued in advanced economies. Today, however, in many sectors the economy of the United States either has already transitioned into a post-industrial era or is in the process of completing such a transition (Saba, 1997). In such an advanced economy, those who can think

independently are rewarded far more than those who conform to a predetermined industrial mold. Yet, the standard model of curriculum design offered through a one-size-fits-all academic schedule completely ignores this fundamental need of learners.

Up to now, other than in occasional experimental projects, the use of the Internet in education has been limited to delivering courses. Its unique ability to adapt courses to the needs of individual learners has been neglected. Currently, most Internet-based courses have inflexible structures and do not include any features to differentially respond to learners based on such variables as learning preferences and prior knowledge of the subject. Personal initiative and the ability to think creatively and autonomously are the most valued skills in today's post-industrial economy. Ironically, it is the promotion of such skills that is lacking in the rigid curriculum design of most Internet-delivered courses.

In short, using the Internet for teaching and learning with standardized curriculum models has not allowed colleges and universities to improve the conditions of learning for their students nor has it economized the cost of education.

The industrial model of Internet-based distance education partially stems from the erroneous idea that an instructor may not be required and that the learner need only interact with the learning materials. Although this form of distance education may be effective in certain instances, it lacks important affordances of a complete educational experience, especially the interaction between the learner and the teacher, and among learners.

A DYNAMIC SYSTEMS APPROACH TO DISTANCE EDUCATION

The post-industrial view of distance education, on the other hand, is grounded on systems science, method, and technology (Moore and Kearsley, 2012). The origin of the application of systems approach to distance education traces to Charles Wedemeyer, professor emeritus of the University of Wisconsin-Madison, who did the following in the 1970s:

- Established the concept of learning anywhere, anytime.
- Combined media for instructional purposes, a practice that later became known as multimedia in an era when researchers were focused on determining the single most effective medium for instruction.
- Implemented the practice of course teams for instructional design in distance education. (Wedemeyer, 1981).

Following Wedemeyer's tradition, Moore (1983) postulated that:

- Distance in education is a social and psychological phenomenon in contrast to the idea of distance in terms of physical separation between learner and instructor.
- The distance between the learner and the instructor—or transactional distance—is determined by the dialogue between the learner and the instructor.
- Transactional distance is measured by two factors:
  - The independence that each learner requires in the teaching and learning process.
  - The requisite structure that the instructor or the instructional institution must bring to bear to ensure that students meet the necessary learning objectives.

Thus, distance in education or transactional distance varies for each individual learner throughout the learning process in a course or in a program of study as dialogue and structure vary in a dynamic process of interaction between the learner and the instructor, and among the learners.

To empirically verify Moore's constructs, and their dynamic relationships, Saba and Shearer (1994) conducted a study in which they used STELLA, a system-dynamics modeling software to simulate the variability of transactional distance with two other variables of structure and dialogue. Data collected from 30 individual learners, who were taught in 30 separate instructional sessions, indicated that in each case when structure (instructor control) increased, transactional distance also increased, and when dialogue (learner control) increased, transactional distance decreased. Therefore the researchers observed an inverse relationship between the rate of dialogue and the level of transactional distance. In this study, while the general pattern of variability was the same for all 30 learners, researchers realized that each individual learner exhibited different rates of dialogue as their personalized instructional sessions progressed.

SIGNIFICANCE OF THE STUDY FOR LEARNERS

Although these results are preliminary and more research is required in this area, several observations can be made:

- Optimal learning may occur under different conditions for different learners.

- Educational systems of the future can optimize the condition of learning if they respond to learners individually in a dynamic environment adaptable to the instructor's need for structure as well as the learner's desire for autonomy.
- Interaction of learner with learning materials is one type of interactivity in distance education; instructor-learner, and learner-learner interactivity are also necessary to create the optimal conditions of learning while offering the desirable level of transactional distance between the learner and the instructor.
- While designing instruction with predetermined outcomes is useful and necessary in certain training programs, such instruction does not provide for spontaneous creativity, which is present in peak learning experiences when learners exhibit emergent behaviors.
- Dynamic learning systems, which provide differential responses to individual learners, offer the condition in which emergent learning behaviors can manifest themselves, while accommodating predetermined learning objectives. In this regard, one can hypothesize that novice learners require a high level of structure, and as their expertise increases, they would also become more self-reliant. (Saba, 2007)

A practical application of these observations for learners is to design learning management systems (LMS) that differentially respond to learning states of each individual learner as these states evolve and change during the course of instruction (Saba, 2008). Such states would include:

- Prior knowledge of the subject matter.
- Learning preferences of the learner.
- Need for different levels of abstractions in encountering new concepts, rules, methods, theories, and paradigms.
- Creativity or novel responses to problems that are presented to the learner.

In recent years, new technologies have emerged that offer differential responses to learners in various courses and programs. These include software such as intelligent agents that use artificial intelligence and recom-

mendation engines. However, the learning management systems used in the overwhelming majority of colleges and universities are still devoid of such technologies. Current LMSs offer a linear path to learning that generally mimics the classroom lecture format, a design that does not support the development of the meta-cognitive skills needed to succeed in life and work in the post-industrial economy.

IMPLICATIONS FOR HOW UNIVERSITIES ARE MANAGED

Sociologist Alvin Toffler posited that embedded in the management structure of educational institutions is a "hidden curriculum" that belongs to an industrial era. This stealth design encourages learners to acquire industrial meta-skills such as punctuality and other competencies that may not be of much use in a 21st century post-industrial society and economy. For example, in the 1960s, while enrolled in the undergraduate broadcasting program at San Francisco State University, the author was trained to be punctual.

My TV production professor, Dr. Herbert Zettl, always reminded us that, "ten o'clock happens at ten o'clock!" Today, in an era when TV audiences watch what they want when they want it, I wonder if such punctuality is as useful to broadcasters as it was in the 1960s. Yes, they still must meet some deadlines and be on time for live programs, but as the audience increasingly streams most of the programs to their computers to be watched at their leisure, the broadcaster's punctuality becomes less important. This is a simple example that illustrates how new technologies are altering the meaning and application of fundamental concepts such as time management in social institutions like education.

The meanings of concepts that we have taken for granted for the past two or three centuries are now changing and finding new connotations, especially for the younger generation who constitute the majority of students in higher education.

Nevertheless, even though we are well into a post-industrial era, most colleges and universities still strictly follow an academic calendar that is tied to requirements of the agrarian era. For many academic organizations the first day of instruction is in the fall to accommodate students' farm chores, despite the fact that not many students work on their parents farms anymore! This starting date was relevant in the 1800s, when the majority of the American population worked as farmers. Nowadays, farmers constitute only 2 percent of the population, yet we still follow an outdated tradition! (Saba, 2006).

Moreover, this academic calendar has little or no flexibility for learners who may complete a course of study in a time frame shorter than the customary 16-weeks for those institutions that operate on a semester basis. Among the limitations of traditional education is the way in which differences in learning styles are managed (or mismanaged). Learners who may differ in their prior knowledge of the subject matter, have a higher need for structure, or can accept more autonomy in learning are all required to spend the same seat-time in a classroom or online and receive the same educational treatment as everyone else.

Surprisingly, today, computers that have ushered in the post-industrial era in other social institutions are used in education in a way that constricts progress. They perpetuate the uniform, lockstep offering of courses instead of generating variability in scheduling for learners with different needs.

In total disregard of individual differences most courses move at the same set pace. This uniform pacing may have been desired in the industrial era, when production lines in factories also moved at a steady speed. However, this pacing is not serving any purpose for learners in the second decade of the 21st century.

The industrial-management structure of colleges and universities dramatically inhibits the flexibility that dynamic distance education systems can offer students and instructors. Time and money are wasted when institutions do not offer programs with differential learning options to learners. The one-size-fits-all course structure today is becoming increasingly more costly because it prevents the system of higher education from responding better to the needs of the learners in form and function. In systems terminology, organizations that cannot respond appropriately to their environment will wither away.

IMPACT ON INSTRUCTORS

Faculty are solo workers (Saba, 2012). Like the craftsmen and women of the pre-industrial era they do not enjoy the affordances of modernity such as division of labor. Instructors create their own courses and deliver them without the benefit of assistance from an instructional designer, an evaluator, a graphic artist, or any other professional who might enable them to provide more effective courses. Also lacking is the provision of sufficient funds for instructors in creating courses. In a typical academic department budget there is usually no line item for creating a course. If such modern

means (i.e., division of labor and infusion of capital) are afforded to faculty through a grant or a special project, it is only for a limited period.

Clearly, there is a gap between the outmoded professional lives of faculty and that of the university administrators who live in a modern culture characterized by division of labor and standardized budget and accounting systems. The primary objective of the administrator is to meet the needs of students as uniformly as possible. As such, there is considerable lack of synchronicity between the pre-industrial culture of the faculty and the industrial culture of the administrator, not to mention the post-industrial culture of the learner.

When faculty see that the modern industrial structure of the university administration precludes meeting the individual needs of students by providing them with variable structure and autonomy, they are compelled to ask: Why should they use information technologies to offer a one-size-fits-all course to a large group of students? Especially when the same results can be obtained with less expensive means and without the cost of an instructional design team as well as a multimillion-dollar information technology infrastructure.

CONCLUSION

The response to that question will determine the role distance education will play in future of higher education. Whether or not the decision-makers, stakeholders, lawmakers, educational administrators, academic senates, and other governing bodies can learn to adjust and coordinate institutional policies with information technology is yet to be seen.

How distance education is organized and practiced in the next few years will also define the extent to which faculty can relate to the administrative culture of the university. In the near future, if faculty are offered differential staffing and operating funds to meet the individual needs of the learners by creating and offering adaptive courses, distance education will remain academically relevant and economically cost effective. The major hypothesis put forward here is that a dynamic model of course development that responds to learners differentially will accomplish these goals:

- Decrease the overall cost of education.
- Increase the relevancy of education to learners.
- Increase the synchronization of the three cultures of faculty (pre-industrial), administrators (industrial), and learners (post-industrial).

In recent years whenever a new communication technology (radio, television, satellite and cable) has emerged concomitant new modes of distance education have also emerged.

Unless the current experience with the Internet succeeds in decreasing the cost of education and increasing the relevancy of the learning experience to the learner as described here, distance education will once again leave center stage, only to re-emerge later with the inevitable arrival of a new technology.

Similar to individuals, each institution is unique in its vision, mission and organizational structure. A systems approach, using system dynamics method, however, allows institutions to look into the future and enable themselves to use distance education in the era of the Internet to individualize instruction and personalize the academic experience of learners.

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