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Distance learning, virtual classrooms, and teaching pedagogy in the Internet environment

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Abstract

The Internet and distance learning have created a new business and a new teaching pedagogy. The purpose of this paper is to show how data communication technologies have affected distance learning and pedagogy, and help teachers and students in virtual classrooms. In particular, the paper addresses the history of distance learning, current issues, the federal government's role, and four specific areas of improvement: curricula change, new patterns of interaction, changes in organizational structures, and the roles and activities of participants in both business and academic distance-learning environments.

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1. Introduction

Distance education has become widespread in the past 10 years. Universities and corporations are seeking to become involved in this “re-invented” form of education. The total enrollment in courses delivered through various forms of distance education between 1997 and 1998 has been estimated at 1.6 million students [3]. Higher education has become a booming business, with annual revenues of 225 billion dollars in 1999. It appears that universities, corporations, and governments are profiting from this new learning environment [27].

Considering that more people are pursuing a second degree after earning a baccalaureate, and more full-time employees are seeking to advance their careers by taking training courses, the virtual education market will continue to grow.

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According to Freddolino and Sutherland [11], many distance education students are not traditional students. Some are adults seeking to build a second or third career, while others are professionals seeking to advance in their current positions. While large investment firms like Merrill Lynch, BancOne, and venture capital groups are investing in distance learning, online learning is still in its infancy.

In this paper, we will examine several aspects of distance learning in both academic and business environments. We begin with a definition of distance learning, continue with its history, and follow this by a discussion of the government's role in shaping the current setting for distance education. Discussions focus on four aspects of improvements (curricula change, new patterns of interaction, changes to organizational structure, and roles and activities of participants) in both academic and business environments.

2. Distance learning: an overview

Almost every new media has touched the educational system in some way but distance learning is a re-invented method of education, rather than a new one. In its early days, distance learning consisted of correspondence education, televised courses, collections of videotapes, and cassette recordings [32]. Slide projectors, microfiche, and microfilm allowed students to recall history via photo negatives. Cable television, VCR's, and Satellite TV allowed students to participate in classes on their own time. The Internet, Intranets, and the creation of local area networks (LAN) and wide area networks (WAN) have given students the opportunity to experience distance learning beyond pre-recorded classes and films. Table 1 shows the history of distance education.

While the field of distance learning using the Internet and large networks is still young, finding a clear and concise definition for it is no easy task. For the purposes of this paper, we will use the definition of the United States Distance Learning Association's (USDLA) National Policy Recommendations.

The USDLA states that distance learning involves teaching through the use of telecommunication technologies, which transmit and receive numerous materials through voice, video, and data.

Furthermore, distance learning must have a delivery mode that uses some form of telecommunication. This means that a course must be delivered via television, videocassette disc, film, radio, computer networks or other devices that use some audio–video format. In the early applications of distance learning, the major forms of communication between a student and a remote location were television, video cassettes, or audio tape cassettes. With the growth of the Internet and large networks, students now have an opportunity to utilize asynchronous and synchronous communication tools, as well as to choose the time, place, and pace of their education.

Table 1
The history of distance learning

Years	Characteristics	Milestone
1700–1900	Use of mail to deliver course material	Establishment of US Postal System
1920–1960	Correspondence education	Use of correspondence education in higher education
	Use of radio and television for correspondence education	States pass laws requiring students to attend school Use of correspondence education in the military
1970–1980	Use of pre-recorded video recordings Use of cassette recordings Use of “collections” Limited number of broadcast channels Mainly used in research and sciences to share information	
1980–1990	Teleconferencing	Emergence of Arpanet, which became the World Wide Web
	Video conferencing Less expensive video recorders Cable networks start programming for K-12 students More televised programs	
1990–Present	Less expensive computers Greater access to technology Internet in classrooms More educational institutions and businesses utilize distance learning Computer based training (CBTs) Synchronous and asynchronous communication	Dominance of World Wide Web Emergence of wireless technology More financing from private industry and universities

If used correctly, distance learning holds a great promise for education. A frequently cited advantage of distance learning is the potential reduction of financial burdens for colleges, universities and other educational institutions. Distance learning allows remote classrooms to reduce overcrowding and improve teacher to student ratios. It also gives students the opportunity to interact with a diverse group of fellow students.

Distance learning gives businesses the opportunity to retain a workforce that is capable and up-to-speed. Employee training, fees for conferences, educational seminars, and the costs of hiring consultants can be reduced when companies utilize distance learning and computer based training (CBT) courses. They enable organizations to cross geographic boundaries, cut costs, and share knowledge. But it is expensive: instructors must be paid, and funds must be allocated for the creation, maintenance, and operation of networks that support distance-learning classrooms. In some cases, distance learning can also increase costs for both students and the institutions [14].

3. The history and evolution of distance learning

Distance learning is an old idea with a new name. Its foundation goes back to the early 1700s when through correspondence students and instructors exchanged information (assignments, notes, and tests) through the postal system or other modes of transportation. Correspondence courses grew because of a need to educate and entertain people. But on-time delivery of mail was a problem in the early days. Because the postal service was slow, students and teachers could not count on regular deliveries. Historical accounts indicate that while correspondence education was established in America, as well as Great Britain, in the 1700s, it took the establishment of the United States Postal Service to firmly secure correspondence education in America.

“In 1891, Thomas J. Foster provided pamphlets by mail to teach mine safety” [24]. Anna Eliot Ticknor “... is credited by some as being the founder of correspondence study in the United States” [20]. Ms. Ticknor founded the “Society to Encourage Studies at Home”, an educational correspondence society that offered 24 courses with six different departments. Young women of leisure, who sought to enhance their education while confined to their homes, made use of these courses [24].

As America’s population grew, college and university faculties sought new ways to share information across geographic boundaries. According to USDLA’s National Policy Recommendations, Rainey Harper, President of the University of Chicago, organized a correspondence study department in 1892 which pioneered distance education. In a rapidly growing economy, the education of a large segment of society became a necessity. In 1890, many states passed laws that required young people to attend school. In an attempt to combat low attendance and high dropout rates, schools turned to correspondence education to help relieve some of these problems.

While correspondence courses were started by academic institutions, it soon became a way to train employees. “By 1943 the United States Armed Forces Institute used correspondence courses to train individuals.” Businesses began to use it as a way to train and re-train employees, to supplement in-class instruction and to cut costs [20].

As early as 1928, courses were offered via radio. Television provided educators with a new medium. This integration of technology and education became known as distance learning. The current widespread use of computers, networks, and the Internet, is yet another medium that offers much more than correspondence courses could offer in the past.

4. Government involvement

The government made attempts to join the world of distance learning with the creation of the National Information Infrastructure (NII).

In nonlegal terms, aggregate of all information technology required to create a universal, affordable, integrated, seamless, interactive and flexible digital communications infrastructure in the United States that facilitates unimpeded any-to-any connectivity for any commercial, industrial, educational, and governmental purpose [22].

Many feel that the NII will improve the American educational system, create jobs, educate the public, and bridge the gap in the “digital divide”. In order to accomplish these goals, the government must act both as user and regulator. Many departments in the federal government are clients of distance-learning providers. NASA, the Department of Energy, and the Department of Defense all use distance learning for employee training and education. These three departments formed the National Research and Education Network (NREN). NREN seeks to support the development and implementation of a national broadband network for applications such as supercomputing, and to test and demonstrate advanced information technologies before they are deployed commercially.

The government also funds various distance-learning initiatives. The best known and widespread is the public broadcasting system (PBS). Although some may not think of it as a source of distance learning, PBS broadcasts television programs that are intended to teach first and only entertain second. PBS’s mission is to inform, to inspire, and to educate [23]. PBS has numerous educational programs for both children and adults.

In 1997, the federal government took steps to create a distance-learning system that would encompass government, industry, and universities. The advanced distributed learning (ADL) initiative was introduced with the intention of creating collaborative projects of research, development, and assessment of new learning technology prototypes, guidelines, and specifications [28]. ADL seeks to facilitate development of common standards; lower development costs; promote widespread collaboration that satisfy common needs; and make learning software accessible, interpretable, durable, reusable, adaptable, and affordable.

The government also regulates distance learning. The Federal Communications Commission (FCC) has a mandate to make sure that network service providers meet telecommunication standards. “The federal government establishes a benchmark that must be followed by the local authorities” [22].

Recent passage of the *Internet Equity and Education Act* further enhances the incentives for the development of distance-learning programs and demonstrates the government’s role in regulating distance education. Higher education institutions offering more than 50% of their courses as correspondence courses were not eligible to participate in federal Pell grant, loans, and other financial aid programs, until the passage of this law. In addition, the idea of an academic year has also been redefined. Twelve hours of regularly scheduled instruction (lectures, exams, preparation for exams, etc.) had been considered a week of instruction for those programs using credit hours but are not on semester, trimester, or quarter system. Under this law, a week of instruction is defined as at least one day of instruction a week either online or in class. As a result, those institutions teaching most of their

courses by telecommunications are now considered higher education educations for the purpose of federal financial aid. The goal of this act was to amend the Higher Education Act of 1965 to offer the opportunities for higher education through online or telecommunication devices.

5. Current issues

The most important issue is instructor preparedness and student attitudes. If distance-learning courses are properly designed and delivered, students can learn as much as in traditional on-campus courses [14]. But if students do not perceive the technology as useful, they will not be receptive to distance education [7]. There are also geographic issues that must be addressed. While distance learning can cross geographic boundaries, it also has the potential to break cultural rules, norms, and educational learning systems.

McCambell points out that students taking distance-learning courses should seek a setting for taking a course with little disturbance, ensure that their systems are set up properly, and make a commitment to complete the course in a timely fashion [21].

The inability of teachers to develop the necessary skills, to adopt a positive attitude, and to develop the needed pedagogy are other important issues affecting the creation of distance-learning communities. These communities must also address technical and curriculum issues. To create a virtual classroom, one must plan for the following tasks: advising, curriculum development, content development, articulation and credentialing, learning delivery, hardware choice, and assessment.

In the sections that follow, the authors will elaborate the following four issues related to distance learning in both higher education and business environments: (a) curricula change, (b) new patterns of interaction, (c) changes in structure of organizations, and (d) roles and activities of participants.

6. Distance learning and higher education

While distance learning has been used effectively in many K-12 institutions, the real growth has been in adult learning and higher education. More colleges are following this new “trend” by offering certificates and degrees using distance courses. Oblinger and Kidwell [27] assert that distance education allows states and universities to achieve four principal goals: to expand access, to alleviate capacity constraints, to capitalize on emerging marketing opportunities, and to catalyze institutional transformation. The growth of, and the interest in, distance learning is great, but the question remains how distance learning will impact education. Some of the more pressing issues such as curriculum, faculty/student interactions, and choice of applications often take precedence over the creation of an appropriate pedagogy.

6.1. *Curricula change*

Crawford [9] notes that the current generation of children is already immersed in a multimedia “data storm”. However, not all students come with the same technological skill set. In addition to being able to use software, students also need a foundation in computer technology, and need to know how to deal with error messages, computer crashes, and other “mini disasters” that may happen. Therefore, procedural instructions and tutorials are a prerequisite for ensuring students’ technical competences and must be carefully designed.

In addition, perceptions that distance learning saves time and expense for faculty and students may be unfounded in many instances. As in traditional programs, distance-learning students are still required to prepare lessons, finish assignments/exercises, and take exams. The advantages of distance learning may lie in the time saved to commute, but that may be offset by the additional time and effort spent on the technology, asynchronous and synchronous communications, and other course activities. Students’ technology and communications problems may be alleviated when the course delivery system becomes standardized and supplemented with a set of well-defined tutorials and instructions. The goal is to prepare students with a basic set of technical skills that are transferable from one course to the other so that recurrent impact of technical issues and concerns may be minimized.

6.2. *Roles and attitudes of participants*

Compared with traditional course delivery methods, distance learning demands a disproportionate amount of effort on the part of instructors [6]. Time spent on e-mail correspondence is significantly increased [4]. Hartman et al. [17] found that messages exchanged in terms of the additional amount of time spent by the instructors included course administration (30.3%), course content (53.9%), and interpersonal issues (15.8%). These percentages confirm that teaching distance courses includes not only the time required for the actual delivery of course materials, but it must also involve a great deal of time dedicated to student support and teaching preparation.

In their article *Teachers’ Perspective and Use of Educational Software*, Niederhauser and Stoddart [26] explore the different kinds of pedagogies that develop when teachers are faced with integrating technology into a classroom. The article asserts

Personal belief systems exert a powerful influence on what teachers learn from reform initiative and staff development programs on the curricular decision-making and on the instructional practices they use in their classrooms.

They also state

Prior research in several subject areas has demonstrated that teachers tend to adopt new classroom practices based on whether the assumptions inherent in the new programs were consistent with their personal epistemological beliefs.

This attitude coupled with administrators' desire to earn an economic return on their investment is in part to blame for the lack of special pedagogy for distance learning in higher education.

6.3. Changes in the structure of schools

There is a connection between pedagogy, personal experience, and distance learning. When a teacher is somewhat reluctant to use technology or views it in a negative way, pedagogy may suffer. The method of introducing computers to faculty is another factor in the personal development of technological pedagogy. Niederhauser and Stoddart state

Policy makers still tend to operate as if educational change is a unidirectional process. They assume teachers will accept and implement curriculum and instructional methods mandated from top down. A large body of research has demonstrated that many educational initiatives failed because they had little impact on teachers' beliefs or practices [26].

For instructors, this means that while administrations push for the use of distance classrooms and computers in classes, they neglect to seek input from those who will actually implement these changes. Besides the time spent on additional communication efforts, faculty members may experience other barriers such as time needed to learn the technology, frustrations with malfunctioning technology, much lead time in preparing the distance-learning materials, less time for research, and added monetary costs to work with technology at home and at the office [33]. Therefore, the structure, support, and promotion must be adjusted for appropriate delivery of quality distance-learning courses. For example, many of the technical issues may be eliminated through the standardization of delivery methods. This standardization further reduces the time and effort of technical staff in supporting the system. As a result, the training of faculty, staff, and students will be further centralized, and hence more efficient cost reductions can be accomplished.

The technical issues are only one part of the problem. Distance-learning programs vary in size and sophistication. MBA programs can range from 10 to 500 students per class [33]. Teaching load, promotion, and tenure are becoming an issue for schools involved in distance education. AACSB's report "Quality issues in distance learning for management education" makes 17 recommendations, as a result of their effort to assist schools developing distance-learning programs and peer reviewers evaluating distance-learning programs. One recommendation suggests that faculty resources for the distance programs be systematically monitored, and faculty recruitment, reward, and development reflect the duties and/or responsibilities that faculty members perform in these programs [5].

6.4. New patterns of interaction

Ruman and Gillette [30] note that the rationale for using the World Wide Web to deliver course material, as well as to promote classroom interaction, is based on the potential of this technology to provide 24 hour access to information from any

computer connected to the Internet. However, technology and the availability of course material are the prerequisites for distance-learning programs. Even though the delivery media are always available, the instructor's availability is usually limited. Furthermore, studies have also indicated that distance learners also need support beyond regular technical levels. For example, Gammie et al. [15] suggest that the lack of the "human element" in support may result in delayed completion of degrees, withdrawal from courses, or a complete dropout from a program.

The human aspects of support may come directly from the person who teaches the course, thus creating new types of faculty to student interactions, over telecommunication media. Although good faculty/student interactions are recognized as being essential to the success of many distance-learning courses, the importance of student/student interactions is sometimes overlooked. Courses that involve a high degree of team work and encourage strong peer interaction require special arrangements to facilitate interactions. MBA courses are typical examples in this group [25]. Student/student interactions may be less important for courses in which performance evaluation is primarily based on independent individual work.

6.5. Current developments and future challenges

There are several techniques for the successful implementations of distance-learning communities. In institutions of higher education, administrators often use systems different from those of students and faculty. Many universities, therefore, find it hard to incorporate the appropriate technology uniformly in all departments.

In selecting Interactive Distance Learning (IDL) applications, telecom/datacom managers of universities need to take into account a number of factors, some of which are specific to the university telecom/datacom environment [22].

Factors such as physical location, size, and specialization are important factors in the creation of data systems in support of distance learning.

In addition to having to link administrators' offices, universities have to provide service to students both on and off campus, as well as to faculty, research facilities, and libraries. Distance-learning communities within universities must provide collaborative learning environments, access to databases/libraries, as well as to remote locations.

Universities have many of the same options as businesses for creating Internet/Intranet based distance-learning environments. If configured inappropriately, the Internet solution is no more secure than any other communication medium. For example, when checking grades, students may be required to type in their ID and password. Messages sent over the Internet run the risk of being intercepted. Eavesdroppers can steal IDs and passwords and even fake the identity of the users. Thus, all communication media, including the Internet, should always be equipped with security protection for the proper delivery of sensitive information.

7. Distance learning and corporations

Corporations will probably become the largest investors and clients of distance learning. Facing increasing levels of global competition, many US corporations have a serious and urgent need to develop rapid and continuous learning processes for their employees, partners, and suppliers. Distance learning provides a viable means for up-grading employee skills, establishing better communication with customers, and developing products and services rapidly.

The pedagogy required in corporate distance-learning programs is different from that in academic settings. “Traditional education is focused on individuals, with a secondary mission to achieve productive results. Business is focused on productivity, with a secondary mission of educating individuals, as a means to the corporate end of profitability” [18]. Because of these circumstances, pedagogy not only includes the art of teaching, but it includes a mix of strategic planning, project management, and change management.

7.1. *Curricula change*

Small business owners and managers, who may be overwhelmed by daily survival issues, are pressed for time and more interested in training programs that are immediately applicable and focused on performance and productivity [12]. These managers, however, may have barriers to online communication and collaboration [19]. Nonetheless, some studies (e.g. [10]) suggest that distance learning has the potential of being useful for small businesses. With the uneven experience of small business leaders in computer based training methods, a mixture of training materials (e.g., printed, CD-ROMs, online) and training methods may be desirable, and need to be carefully designed to balance the skill levels of trainees.

Distance learning in the workplace is generally considered less effective when is used as the sole training method [31,34]. A successful curriculum design appears to involve a mixture of training methods with a high degree of customized support. For example, the FrontLine program described by Hamilton-Jones [16] offers a bachelor degree through distance learning to Coca-Cola and Schweppes workers. Tailored course materials for individual students and the relationship between “tutor mentors” and individual students make the program successful. Tutor mentors work directly with the students’ supervisors and provide structured support and integration with the company’s management system. The degree is part of the student’s employment contract. As a result, the curricula no longer simply consist of one-way or two-way interactions between student and instructor, but become a network of support, and help students complete their degrees successfully.

7.2. *Roles and attitudes of participants*

In academic settings, the pedagogy focuses on the instructors’ attitude toward technology in education. This attitude affects how instructors approach the courses they teach. Instructors in business courses on the other hand are motivated by the need to produce results, as most of their students are being trained with specific

objectives in mind. Employees choose to enroll in distance-learning programs because they need to solve problems in their jobs, further their careers, earn raises, or perform new tasks [29].

Management, of course, plays an important role in the successful implementation of distance-learning programs. It is imperative that employees fully understand and go along with a company's strategic plan because these plans can affect the pedagogy of these programs. Minoli states that dialog between managers and employees accomplishes two important aims: "(1) The ability to generate feedback among employees about planned changes, and (2) to create consensus among employees to ensure that the strategies are implemented, not undermined because of the lack of employee support or understanding." [22].

7.3. Change to the structure of organizations

Berge studied 10 "barrier factors" to distance education as a function of five stages of technology preparedness in corporate environments. The study shows that "organizational change" appears to be a top ranked barrier at all five stages of corporate preparedness. These five stages are: (a) potential company has not made an attempt to use distance learning [pre-distance education stage], (b) sporadic distance-learning events have occurred [stage 1], (c) organization's technical capability is ready for distance learning [stage 2], (d) distance-learning policy and planning have been established [stage 3], and (e) distance learning has been institutionalized [stage 4] [1].

Clarke and Hermens [8] suggest that advances in technology and volatile market environments have triggered three new distance-learning opportunities for businesses. First, universities, technology companies, and e-learning companies are strategically allied to extend training capabilities globally. Second, e-training companies, many small in size, offer innovative modes of electronic delivery. Third, large companies have begun to develop their own "corporate universities", with their own delivery systems. Any one of these delivery modes and training options may introduce changes in organizational structure. For instance, companies in the pre-distance education stage (in Berge's classification) may have to undergo some major re-structuring and technology building processes to adopt the "corporate universities" training option, whereas companies whose planning and policies have been established (stage 3 in Berge's classification scheme) may have a more advanced technology infrastructure.

Berge and Smith [2] identify three important components of the pedagogy in corporate distance-learning settings: conditions, conduits, and context. Conditions and conduits are important, but "context" appears to be the most important factor. Berge and Smith identify "context" as change management that addresses the necessary circumstances and linkages to theory, which predicts patterns of behavior. While pedagogy in higher education focuses on, and provides guidelines for teaching, change management focuses on the human factors in implementing distance education in businesses. Berge and Smith identify four causes that hinder corporate distance learning: lack of comfort in teaching and learning, lack of trust

among different functions with different expertise, lack of skills with technology, and lack of resources and poor design.

7.4. New patterns of interactions

Some organizations have introduced new elements when creating distance-learning communities. For example, Sprint, in an attempt to help employees adjust to being “in class”, created an environment that made participants feel as if they were literally in class rather than sitting alone in their cubicle with a computer screen.

Industry generally supports collaboration and interaction features which may include around the clock mentoring, expert led chats, peer-to-peer chats, seminars, threaded discussions, mentored exercises, discussion boards, workshops, study groups, and online meetings [13]. Many of these activities are a simulation by technology of face-to-face interactions. All these features need careful planning. Their indiscriminate use or careless packaging by multiple technology vendors could result in excessive learning requirements of different technologies, and make distance learning a daunting task for students on the other side of the “digital divide”.

7.5. Current development and challenges

While distance learning has its share of success stories, it also has failures. Many failures can be attributed to the fact that managers often do not take enough time to create systems that meet the needs of their users. There are several ways in which businesses incorporate distance learning: intracompany collaborative learning and research, remote university education, and telecommuting applications.

Intracompany collaborative learning and research enables companies to include all departments when creating new products. This type of distance learning requires networking software and visual/audio capabilities. Corporations also make large grants to universities as a way of providing employees with educational alternatives that include degree programs offered during after-work hours, as well as continuing education [22].

While there is no doubt that technology is readily available to create distance-learning courses, implementation, maintenance, and ongoing monitoring remain a challenge to be shared by business. Knowing what specific technologies are available to the clients of distance learning is essential. Other challenges in the corporate environment include instructor attitudes, resistance from employees, high capital cost, and inadequate review and performance systems.

8. Conclusions

Distance learning has undeniably changed the way people are educated. It will continue to change the way business is conducted and it will continue to change the global market place. While universities, corporations, and governments are rapidly embracing this tool for learning, many issues remain. This paper has attempt-

ted to identify some of these issues. It is imperative that the pedagogy continues to evolve and grow as technologies change.

The biggest concern is how distance learning and technology will change the educational system in the long-term. As Roger Crawford so eloquently stated:

A generation of children is emerging already immersed in a multimedia “data storm”. Their understandings and expectations of the world are mediated through their experiences of multimedia and ICT’s and these differ from those of preceding generations nourished on linear technologies. Educating these children using models of teaching and learning that are grounded in concepts of knowing and understanding that are linear and finite will not help them succeed in a technological global factor where multi-disciplinary, holistic approaches predominate.

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