



ISSN: 1545-679X

# Information Systems Education Journal

Volume 4, Number 86

<http://isedj.org/4/86/>

September 29, 2006

In this issue:

## Jumping off the Distance Learning Bandwagon: Adding Learning Theory into the Strategy

**Thomas Janicki**

University of North Carolina Wilmington  
Wilmington, NC 28480 USA

**Alan Burns**

DePaul University  
Chicago, IL 60604 USA

**Abstract:** Distant education and distant learning has expanded rapidly for two and four year educational institutions since the mid 1990's. Both synchronous and asynchronous means of delivering learning' occurs on a daily basis. As these uses grow it is important to recognize the driving forces and future challenges facing distance education for educational institutions. Historically, technology advancements have pushed the educational institutions to new methods of delivery. However the push of technology rarely indicates an optimal strategy for its implementation. Instead strategies must be in place to pull the design and implementation of new technology needed to support the goals of higher education institutions. Especially important is the need to increase learning theories into the delivery of distance learning courses. This paper provides a review of the current and future challenges concerning distance learning for educational institutions include the proper strategic planning for the development of new infrastructures as well as the design, implementation, and delivery of new course materials and new approaches to teaching.

**Keywords:** distance learning, asynchronous learning, distance education, learning theory, web-based training

---

**Recommended Citation:** Janicki and Burns (2006). Jumping off the Distance Learning Bandwagon: Adding Learning Theory into the Strategy. *Information Systems Education Journal*, 4 (86). <http://isedj.org/4/86/>. ISSN: 1545-679X. (Also appears in *The Proceedings of ISECON 2005*: §3123. ISSN: 1542-7382.)

This issue is on the Internet at <http://isedj.org/4/86/>

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 8 Sep 2003. • Title: Information Systems Education Journal. Variants: IS Education Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: [subscribe@isedj.org](mailto:subscribe@isedj.org). • Subscription price: free. • Electronic access: <http://isedj.org/> • Contact person: Don Colton ([editor@isedj.org](mailto:editor@isedj.org))

### 2006 AITP Education Special Interest Group Board of Directors

Stuart A. Varden Pace University EDSIG President 2004		Paul M. Leidig Grand Valley State University EDSIG President 2005-2006		Don Colton Brigham Young Univ Hawaii Vice President 2005-2006	
Wendy Ceccucci Quinnipiac Univ Director 2006-07	Ronald I. Frank Pace University Secretary 2005-06	Kenneth A. Grant Ryerson University Director 2005-06	Albert L. Harris Appalachian St JISE Editor	Thomas N. Janicki Univ NC Wilmington Director 2006-07	
Jens O. Liegle Georgia State Univ Member Svcs 2006	Patricia Sendall Merrimack College Director 2006	Marcos Sivitanides Texas St San Marcos Chair ISECON 2006	Robert B. Sweeney U South Alabama Treasurer 2004-06	Gary Ury NW Missouri St Director 2006-07	

### Information Systems Education Journal 2005-2006 Editorial and Review Board

Don Colton Brigham Young Univ Hawaii Editor		Thomas N. Janicki Univ of North Carolina Wilmington Associate Editor			
Samuel Abraham Siena Heights U	Tonda Bone Tarleton State U	Alan T. Burns DePaul University	Lucia Dettori DePaul University	Kenneth A. Grant Ryerson Univ	
Robert Grenier Saint Ambrose Univ	Owen P. Hall, Jr Pepperdine Univ	Jason B. Huett Univ W Georgia	James Lawler Pace University	Terri L. Lenox Westminster Coll	
Jens O. Liegle Georgia State U	Denise R. McGinnis Mesa State College	Therese D. O'Neil Indiana Univ PA	Alan R. Peslak Penn State Univ	Jack P. Russell Northwestern St U	
Jason H. Sharp Tarleton State U		Charles Woratschek Robert Morris Univ			

EDSIG activities include the publication of ISEDJ, the organization and execution of the annual ISECON conference held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. • The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. • The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates.

© Copyright 2006 EDSIG. In the spirit of academic freedom, permission is granted to make and distribute unlimited copies of this issue in its PDF or printed form, so long as the entire document is presented, and it is not modified in any substantial way.

# Jumping off the Distance Learning Bandwagon: Adding Learning Theory into the Strategy

Thomas Janicki  
janickit@uncw.edu  
University of North Carolina Wilmington  
Wilmington, North Carolina 28480 USA

Alan Burns  
aburns@cs.depaul.edu  
DePaul University  
Chicago, Illinois 60604 USA

## Abstract

Distant education and distant learning has expanded rapidly for two and four year educational institutions since the mid 1990's. Both synchronous and asynchronous means of delivering 'learning' occurs on a daily basis. As these uses grow it is important to recognize the driving forces and future challenges facing distance education for educational institutions. Historically, technology advancements have *pushed* the educational institutions to new methods of delivery. However the push of technology rarely indicates an optimal strategy for its implementation. Instead strategies must be in place to *pull* the design and implementation of new technology needed to support the goals of higher education institutions. Especially important is the need to increase learning theories into the delivery of distance learning courses. This paper provides a review of the current and future challenges concerning distance learning for educational institutions include the proper strategic planning for the development of new infrastructures as well as the design, implementation, and delivery of new course materials and new approaches to teaching.

**Keywords:** distance learning, asynchronous learning, distance education, learning theory, web-based training

## 1. INTRODUCTION AND QUESTIONS

It is not uncommon for technological advances to lead the transformation of educational processes, business processes, service delivery, and even organizational structure. For example, in the business arena advances in telecommunication capabilities and the widespread use of electronic inventory control programs can be credited with the implementation and proliferation of Just-in-Time inventory management and the accompanying transformations of retail sales industries. Within the education arena the Internet and wireless networks have opened new avenues for research, learning and sharing and dissemination of ideas in traditional classrooms as well as 'education to

the home'. In these cases innovations have created (*pushed*) opportunities for educational institutions to expand their student base as well as become more efficient.

Technology has created opportunities for delivering education in new ways. As telecommunication capabilities supporting the real-time transfer of data, voice and image have improved in speed and quality, combined with decreasing costs; the quantity of Distance Learning (DL) options has grown rapidly in this country. According to the National Center for Education Statistics [2004], 90% of two year public, 89% of four year public institutions and 40% of private institutions offered distance learning options in the 2000-2001 academic year.

Over the past decade, the development and implementation of new communications technologies have pushed DL but it may have also limited DL strategies. DL implementations that merely add new features and components to the delivery of learning materials concepts when newer technology evolves may be risky. At some point, education and learning strategies should begin to drive innovation and implementation, so that technology serves the strategy rather than the reverse. The opposite side of the *push* of technology is the *pull* for new technological advances and the infrastructure demanded from education institutions. In this arena the genuine need for new capabilities results in the *pull* and development of new technology.

The explosive growth of technology for the transfer of data, voice and image has resulted in both push and pull of innovation in education. As opportunities for new kinds of education delivery are developed, it is extremely important that we exercise caution and analysis of delivery methods, their merits, and their limitations in education. As Bernstein [1998] cautions, information delivery is not instruction; new paradigms for delivery of instruction must be developed.

### Questions

What are the basic assumptions of DL? Is a classroom necessary or a historical constraint caused by limited communications technology? Can education be delivered via telecommunications and/or a computer with these new technologies without the need of a traditional classroom?

Do educators and businesses use new technology because it is the latest and fastest available or less costly; or is there planning behind its implementation in academic settings? By erasing the constraints of time and space do we risk losing benefits that were imposed by those constraints?

Consider these two conditions: 1) telecommunications capabilities that are significantly improved (adequate quality in streaming video) and 2) experiences with this technology in an educational environment increase. As these two conditions converge we approach a point where new strategies of teaching and student learning need to emerge for future technological development. This paper seeks to consider the haz-

ards as well as the goals of distance education in order to cause technology to serve education, rather than the reverse.

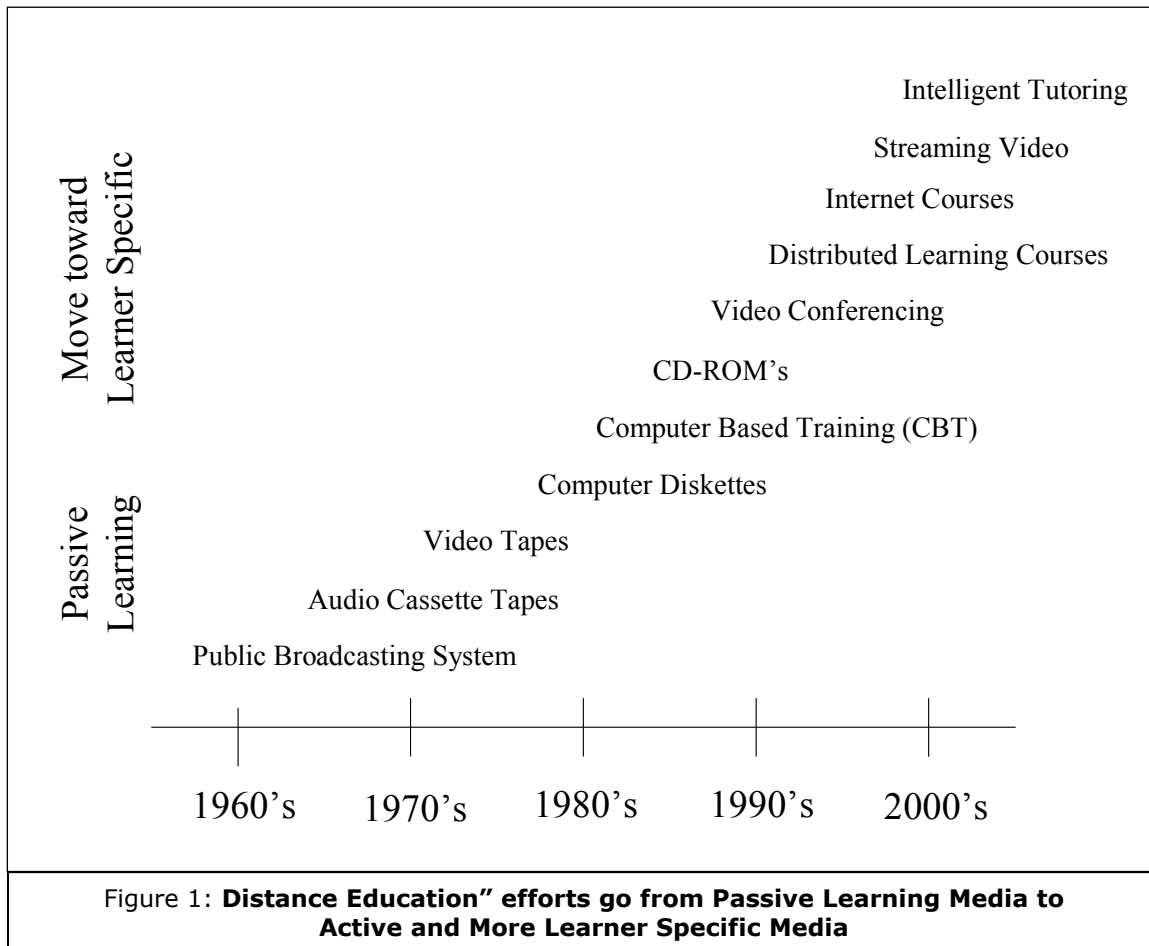
The paper will briefly review historical DL activities in terms of the push and pull strategies and raise questions for future DL initiatives. It will also explore the planning components that lead to successful DL systems and identify several variables in an emerging view of distributed education that will require careful analysis in order for distributed technology to become a true asset to education.

Finally, a key question is do educators include learning theories in the development and delivery of distance learning applications?

## 2. BACKGROUND OF DISTANCE LEARNING TECHNOLOGIES

Definitions, characteristics, and implementation of distance learning techniques vary widely. A widely used definition is that distance learning or distributed education uses information technology to deliver educational or learning processes to remote locations. It may also include the use of technology to free participants from traditional constraints of time, space, or both. Distributed Education (DE) is also used to describe conditions for learning on demand, where participants may engage in learning at a different time than the original presentation [Burgess, 1994].

Push technology (the television) created the first distance learning opportunities over the Public Broadcasting System (PBS). Another advancement in communications technology, the advent of cable television created the Mind Extension University (MEU) and Jones Intercable Services which both offered courses for college credit from various institutions across the United States in the late 1990's. These technologies brought learning from the campus only environment to homes and offices. However they required only very passive participation from the student, with students ordering course materials from local or distant colleges, and then watching videos of taped lectures on their television. Thus was education leading the drive for televised courses based on strategic and good learning techniques or was education merely taking advantage of a new technology?



Over time education has taken advantage of advances in telecommunications to become more interactive and more individualized as shown in Figure 1. Technology has permitted the student to move from a passive role to an active role.

Today, with increases in data transmission speeds between locations, and the general lowering of communication costs per bit transmitted, two-way audio and video has become increasingly accessible. The student has gone from a passive learner to an active participant in the process.

Currently, students are able to take classes from their dorm rooms, homes or workplaces. As more cable modems, DSL (Digital Subscriber Lines) phone lines, and fiber optic to the home (or street) are installed, the speed problems inherent in the transmission of video has decreased.

### 3. HISTORICAL INITIATIVES

#### Pull Strategy

One of the earliest initiatives in DL was in North Carolina and is one example of how a pull strategy can help implement technological changes. Providing higher level math, science, and English courses at smaller rural schools by a 'live' instructor to four or five students was not cost effective. Thus the need to provide rural high schools and grade schools the same course content and course diversity as urban schools stimulated North Carolina to design and implement new learning options. As a result of a state mandate in the mid 1980's to provide all students in North Carolina with the same learning opportunities, the state became a pioneer in innovative distance learning implementations [Patterson and Smith, 1994].

There was a problem of a common infrastructure and delivery protocols because three different telephone companies served

North Carolina. The state government and higher education institutions had to work together to get the three telephone companies to agree on a standard protocol for the transmission and delivery of the distance learning video, audio and data content. To further enhance the adaptation of standards and seeing opportunities to cross boundaries between education and government, the state government agreed to utilize this backbone network for information transfer from the state capital to its remote state office locations. With this commitment for significant usage and potential revenues, the three phone companies serving North Carolina (GTE, Bell South, Carolina Telephone), agreed to video, audio, and data transmission standards [Patterson and Smith, 1994].

#### **Push Strategies**

Examples of educational institutions using a push strategy (using existing technologies that are in place) are also numerous. As early as 1995, Duke University installed an infrared network to connect students' PowerBook notebook computers into a 'Localtalk' network. The instructor's notebook computer was linked to the network, and the students can observe the lecture notes and slides on their personal notebooks. This allows them to add notes to the slides on their PowerBook as the instructor presented them [Setten & Guthrie, 1995].

Textbook publishers such as Course Technologies and McGraw Hill, use wireless and infrared technologies to 'engage' students in large classroom settings. Students purchase or rent a wireless remote and respond real time with the instructor in an auditorium to survey questions. The technology also provides for attendance record keeping and retaining quiz scores by individual students in a spreadsheet. Learning may be enhanced through more active participation and in addition the instructor is aware of the concept they have discussed was really understood by the audience.

WorldWorx Solutions™ is another example of a push strategy of using existing technology, AT&T formed a joint venture with the University of Wisconsin Extension, Pennsylvania State University, and Indiana University by providing video conferencing, network services, products, service and support in a comprehensive package for customers. In exchange for this technology the universi-

ties provide the programming content [ATT-HREF].

Finally the University of Phoenix has been very successful using a push strategy, as it combines distance learning for most students with regional 'satellite' campuses in 34 states to reach 175,000 students in the United States and more recently Mexico [UP-HREF, 2005].

#### **4. DISTANCE LEARNING OPPORTUNITIES**

Distant Learning applications have impacted traditional education organizations at every academic level. Most notably, they appear to be creating new markets and the opportunity to enrich curricula to meet more specialized needs.

At the K-12 educational level, distance technology enables students from remote locations to meet electronically with teachers in urban schools or even at universities. Universities are rapidly identifying ways both to expand curricula and to reach new, geographically dispersed and non-traditional markets. At many schools distance education helps deliver upper level college courses to branch campuses where enrollment would not justify a course offering. The new markets include non-traditional students who may not be able to leave their homes or who are dispersed across the country or even around the world. Combining classes across campuses offers the additional benefit of standardizing quality of the course throughout the university system.

Perhaps most interesting for colleges of business is the opportunities for partnering with businesses to improve training at the workplace as well as conventional business education in the university. Businesses and education institutions have several complementary goals for developing and maintaining a quality workforce. Ives and Jarvenpaa [1996] suggest that a goal of universities should be to work with industry to enhance their learning capabilities as a result of Computer Based Training (CBT) and DL technologies. Distance education can assist in achieving these mutual goals. Businesses need a qualified employee pool as well as continual upgrading of their current pool. Universities have a need to provide high caliber individuals for this pool, and business

can provide assistance to develop the talents of enrolled students.

Electronically, business can provide experts from the field to provide real-life scenarios for the classroom environment. Filipczak [1995] demonstrated that the use of communication and interactive technology permits engineers from industry to participate in the same classroom experiences as engineering students and university faculty. Likewise, businesses can use the resources of universities and other outside experts to bring guest speakers via telecommunications technology directly into their conference rooms. Distance education provides a market for universities to provide customized training direct to particular businesses.

An additional benefit of asynchronous distant learning is the capability to provide course capabilities to the 24/7 market of students who work various hours in a week which constraints them from attending traditional classes [Frydenberg, 2002]. Examples of this student population would include nurses, shift employees and traveling business professionals.

Strategic questions for administrators and deans as related to distant education should include:

- What is the mission of the university?
- Do these programs affect our view of education?
- What is the impact on other programs competing for scarce resources?
- How do we utilize our best talent and compensate them for their efforts?
- What technologies (current or future) are needed to support truly interactive and customized learning?
- What technology infrastructure is necessary to support the above?
- Because universities can go into training for business should they?

##### **5. POTENTIAL VARIABLES FOR CONSIDERATION WHEN DEVELOPING A STRATEGY FOR FUTURE DISTANCE LEARNING INITIATIONS**

DL technology clearly impacts education's physical environment. It may also affect the options and opportunities for the student in

such a way that she may selectively consume education. And finally, it appears that it may radically alter the options and capabilities of the professional educator. A number of issues in each of these areas have emerged as institutions expanded their use of DL technology (in many times to compete with other institutions) and should be actively explored as we redefine our concept of the education process.

#### **Common Body of Knowledge Courses**

Consequently we must begin to consider whether universities deliver unique value to students by offering the same basic **Common Body of Knowledge** (CBK) courses that are available in every other university in the country? Could standard undergraduate general requirements be pre-recorded and stored? Could these standard requirements be delivered universally by the best lecturers in the country? [Beaudoin, 2003]

Obviously, the answer to the question 'Can?' is increasingly 'Yes.' The not-so-obvious question is 'Should?' Before we throw out our CBK courses, we need to consider whether value is added in the traditional class that might be lost in packaged classes, regardless of the brilliance or entertainment skills of the lecturer. According to Cervone [2004], getting agreement on what the common body of knowledge is a major challenge.

How do we optimize education for education? Merely removing space and time requirements does not address the issue of what is optimal for educational considerations. A great number of variables including course content, characteristics of students, and individual learning styles needs to be addressed.

#### **Bricks and Mortar**

Next we may ask: What about the environment? Are classrooms necessary? And can standard courses be delivered 'on demand' by the student? Should students be constrained to take courses only in one country? Again, technology tells us we can move out of the classrooms. Might we lose value in some of our classes if we move out of a classroom? Which values? How can we use the technology to enhance education while protecting current value?

There are certain advantages that distance learning may provide which is even superior to traditional classrooms. An example is that an operations management class may be able to 'virtually' visit a manufacturing plant and discuss quality concerns with the plant manager. Medical students are able to observe surgeries live and question doctors in the field directly from their classroom. Trips for students no longer encompass loading everyone into a bus for a field trip to the canyon or forest or business office. Corporations will find it easier to invite guest presenters from colleges or universities into their meetings without the expense of travel.

### **Role of Student**

These questions lead us to consider a new view of the student as a consumer of education services, rather than as an apprentice or acolyte. Distributable computer instruction materials support independent learning. Cognitive tools permit students to explore the content of what they are learning more independently. [Jonassen et. al., 1995]. Access to and control over more powerful learning tools, and a menu of education services from which he may select the components of education he prefers would empower the student to manage his own education to a new degree. Students will arguably become more responsible for 'self paced' learning. Can students design virtual courses? Are students adequately prepared to design their own education [Leigle and Janicki, 2004]?

### **Role and vision of the educator**

If students assume the role of selective consumers in control of their own education, the role of educator will necessarily change, too. Distributed education implementation requires a shift from 'teacher-centered' to 'learner-centered' approaches. Instructors are no longer the expert and the only distributor of knowledge. Students are no longer passive recipients of information. Knowledge will consist of sharing understandings and intellectual breakthroughs between instructor and student [CAST, 1996].

Jonassen et al., [1995] report that whereas up to 80% of the verbal exchange in traditional classrooms is provided by the teacher, it can drop to 10 - 15% in computer conferencing situations. 'Mediated instruction

moves the teacher from the podium to sideline, from leader to coach, from purveyor of knowledge to facilitator of personal meaning making' [Jonassen et. al., 1995, p.21].

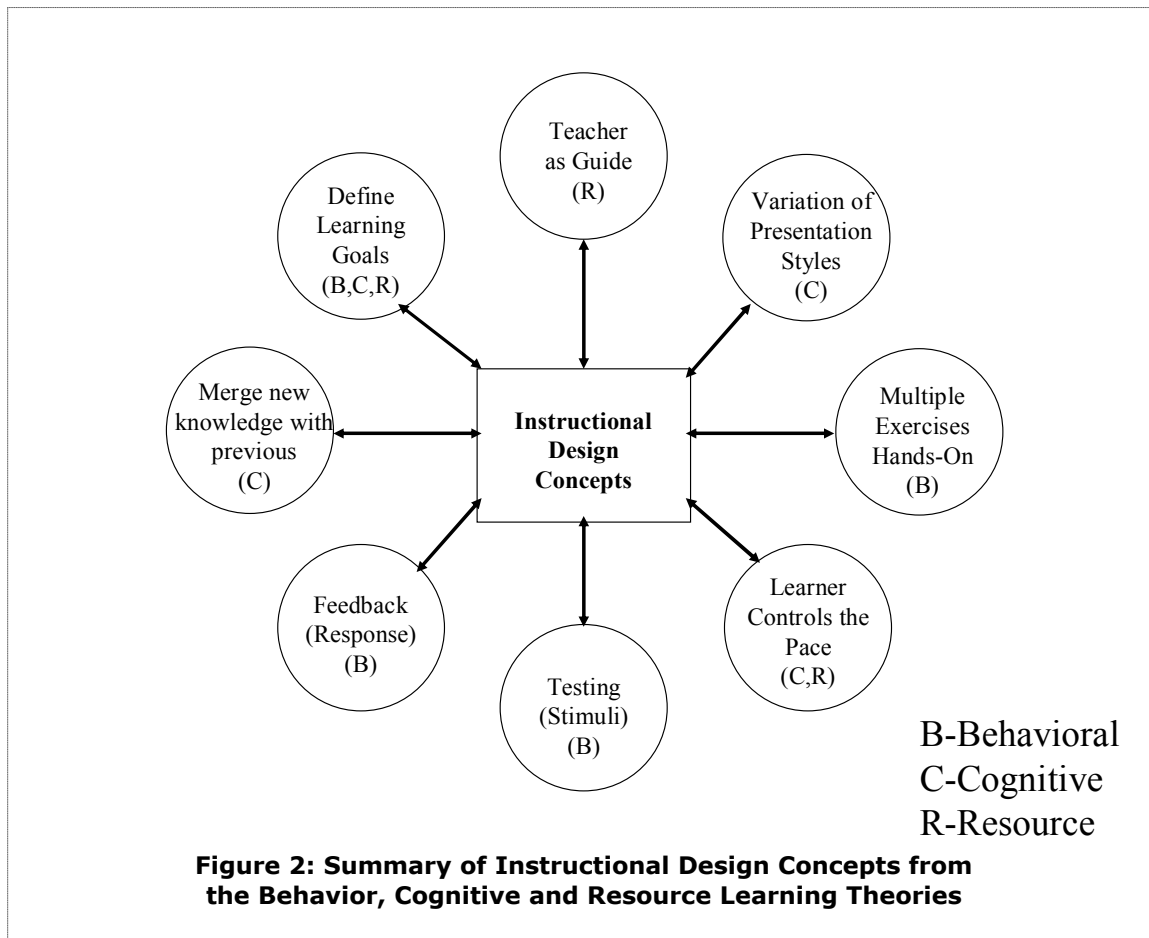
In this view, faculty will become 'managers of the education environment,' as opposed to the personal provider of critical information. Such change is paradigmatic, as we reinvent the educator role from that of the traditional lecturer, in the same physical space and time as their students, to that of a manager of a very rich (and expanding) set of educational resources and as facilitator of the learning process. Again, the technology to enable such a vision exists. We must now question whether the vision is optimal for learning, and if it is how it may be optimally implemented.

In a true interactive learning environment, the course design and content must be different from a traditional classroom setting. Instead of preparing a traditional hour lecture, instructors / developers must think in terms of five to ten minute attention spans. An instructor becomes a 'producer' in addition to the instructor in the classroom. Included in the preparation is the consideration of what new learning experiences can be brought into the classroom. These include computer generated slides, video clips, audio clips, internet resources, 'live feed' from outside experts, as well as hands-on exercises. Courses that change rapidly would involve significant preparation time and could become so obsolete quickly as to not justify the time investment for an instructor or institution. Special consideration is the rapid change of technology and instruction in the Information Systems field. Is it worth the investment to develop a DL course in which the content is obsolete in 18 months?

### **Incorporating Pedagogy into the Development of Distance Learning Initiatives**

Distributed and computer instructed materials may support cognitive and behavior learning theories [Hannafin and Peck, 1988]. Behavior and cognitive tools may include databases, spreadsheets, semantic networks, export systems, computer conferencing, multimedia, and microworld learning environments [Jonassen et. al., 1995]. Much research has occurred in the instructional technology field to identify success





factors in design courseware. Many of these factors have been consolidated into Figure 2.

Figure 2 combines the *instructional design activities* of Dear [1987], the *events of instruction* proposed by Gagne, Briggs & Wager [1988] and Gagne, Wager & Rojas [1989], the *design guidelines* of Hannafin and Peck [1988] and the strategies of instructional design by Merrill [1997] into one framework for instructional design [Janicki & Steinberg, 2003].

**Faculty compensation**

A limitation to widespread adoption of distance education has nothing to do with technology. Rather it is the perception among faculty that the team approach to designing distance instruction may undermine the faculty member’s autonomy [Olcott and Wright, 1995]. Faculty resistance to changing their ‘personal teaching styles’ may be prevalent. Distributed education requires a new approach in the preparation of a class.

Issues pertaining to workload, compensation, and intellectual property ownership provide major concerns to involved faculty [WICHE, 2001]. Current distance education faculty must act as ambassadors to assist new faculty members in the changes to their courses. These ambassadors should stress the advantages of distance education: such as individualized instruction for each student, enhanced learning opportunities for all participants, and the availability to bring new resources into the classroom.

**6. SUMMARY**

This paper briefly covered the evolution of Distance Learning and Distributed Education from a push and pull of technology viewpoint. As with many new technologies, the evolution of faster and higher quality communications technologies *push* the development of new educational opportunities. However if we merely evolve educational policies based on what we *can-do* because of

technology we may be losing sight of what we should do.

Many higher education universities compete in the distance learning arena without a strategy in place that takes advantage of the unique characteristics of an anytime / anyplace delivery of educational content. If current classes are merely notes copied and taped from traditional lecture courses, then we are in a push strategy. Rather deciding the level of interactivity, the level of communication and personalization of the learning should dictate the technology needed and pull the necessary infrastructure with it.

Future study of what the role of personalized education should be, as well as the optimal ways to implement those strategies in light of new delivery methods must be understood. Understanding the needs of the learner and the pedagogy to deliver effective instruction should formulate the strategy for future technological needs.

Other considerations in developing a strategy are: the potential creation of a Common Body of Knowledge to be shared at the introductory level of all universities; the future need for bricks and mortar classrooms; the changing roles for students and faculty, and finally the need for technology to support pedagogy in the delivery of more individualized styles of learner.

In summary, a strategy must be in place to understand the changes to the role of the educator in order that they may deliver the best quality product to the future consumers.

#### REFERENCES

- Beaudoin, M., (2003). "Distance Education Leadership for the New Century", *Online Journal of Distance Learning Administration*, V6, N2.
- Bernstein, D., (1998). "WBT: Are we really teaching?" *Inside Technology and Training*, V2, pp. 15-17.
- Burgess, W., (1994). *The ORYX Guide to Distance Learning*, New York: Oryx Press.
- CAST, (1998). "Technologist need to know about education", *Center for Advanced Study in Telecommunication*, Winter Issue, pp.1-8.
- Cervone, F., (2004). "A Comparative Analysis of Program Curriculum", *Proceedings of ISECON 2004*, paper 3424.
- Filipczak, R., (1995). "Putting the learning into distance learning", *Training*, V32, N10, pp. 111-118.
- Frydenberg, J., (2002). "Quality Standards in eLearning: A Matrix of Analysis", *International Review of Research in Open and Distance Learning*, October.
- Gagne, R.; Briggs, L. and Wager, W., (1988). *Principles of Instruction Design* Third Edition. New York: Holt, Reinhard, & Winston.
- Gagne, R.; Wager, W. and Rojas, A., (1981). "Planning and Authoring Computer-Based Instruction Lessons". *Educational Technology*, V21, N9 pp.17-26.
- Ives, B. & Jarvenpaa, S., (1996). "Will the internet revolutionize business education and research", *Sloan Management Review*, Spring, pp. 33-40.
- Hannafin M. & Peck, K., (1988). *The Design, Development and Evaluation of Instructional Software*, MacMillan Publishing, New York.
- Janicki, T., & Steinberg, G., (2003). "Evaluation of a Computer - Supported Learning System", *Decision Sciences, Journal of Innovative Education*, V1, 2, pp. 203-224.
- Jonassen, D., Davidson, M., Collins, M., Campbell, J., Haag, B., (1995). "Constructivism and Computer Mediated Communication in Distance Education", *American Journal of Distance Education*, V9, N2, pp 7-26.
- Leigle, J., & Janicki, T. (2005). "The Effect of Learning Styles on the Navigation Needs of Web-Based Learners", *Computers and Human Behavior*, forthcoming.
- Merrill, M.D., (1997), "On Instructional Strategies", *Instructional Technology Magazine*, V2 N1.
- Olcott, D., & Wright, S., (1995). "Institutional Support Framework for Increasing Faculty Participation in Post Secondary Distance Education", *American Journal of Distance Education*, V9, N3, pp. 5 -17.

Patterson J. & Smith, W., (1994). "North Carolina Vistanet", *IEEE Network*, V8 N6, pp.12-18.

Setten, G. & Guthrie, S., (1995). "Wireless infrared networking in the Duke paperless classroom", *T.H.E. Journal*. V23 N3, p. 87.

WICHE, Western Interstate Commission for Higher Education (2001), "Best Practices for Electronically Offered Degree and Certificate Programs", Boulder CO.

#### **Internet Resources**

AT&T Joins leading universities in distance learning alliance <http://www.att.com/press/1094/941012.gba.html>

National Center for Education Statistics <http://nces.ed.gov/programs/coe/2004/section5/indicator32.asp>

University of Phoenix - <http://www.phoenix.edu/mediarelations/populations.aspx>