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The nature of disruptions encountered by

classroom teachers is changing. In the

past, disruptions were typically students

chewing gum, eating or taking naps during

class, engaging in acts of incivility including

the occasional brawl, and the like. These disturbances,

in many ways, pale in comparison

to those accompanying the use of technologies

in today’s classrooms. While the Internet may

be a wonderful teaching and learning tool in

the classroom, it can also be an obstacle in the

learning process (Adams,

2006: Kearsley, 1998).

With the adoption and

implementation of the Internet

and other digital

innovations in the classroom

came new genres of

challenges in coping with

the disruptions they create

in learning environments.

The problems and disruptions

include technologysupported

cheating opportunities; communications-

related distractions from emails, instant

messaging, computer games, web surfing, and

other “personal projects”; lack of engagement

with the instructional setting caused by the substitution

of classroom experiences with pre-recorded

and downloadable class materials from

various sources including course management

systems and pod-casting from iTunes; and lately,

increasing incidents of bullying and intimidation

supported with innovations including the Internet,

text messaging, and social network sites.

Commenting on the effect of technology

in education, Kearsley states that, educational

technology has become “primarily, if ironically,

a distraction from what matters most—effective

learning and good teaching” (1998, p. 47). These

unintended effects of technology are manifested

in higher education, middle and high schools,

and even elementary schools. While the focus of

this paper is on higher education, the description

of technology-related disruptions and their

consequences may also apply to pre-higher education

settings, and thus may carry additional

implications for teaching and learning in these

settings.

**The Adoption and Integration**

**of Instructional Technologies**

**in Learning Environments**

Students in higher education are using technology

like never before. In their study of undergraduate

student use of information technology

Katz, Kvavik, and Salaway (2006) reported that

98.8% of underclassmen owned their own PC;

38.3% began their undergraduate careers with

**Good Intentions and Unanticipated Effects:**

**The Unintended Consequences**

**of the Application of**

**Technology in Teaching and**

**Learning Environments**

By John Nworie and Noela Haughton

**T**

*“There are*

*unintended effects*

*that accompany*

*the adoption of*

*technological*

*innovation….”*

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their own laptops; students spent, on average,

23 hours per week engaged with technologies,

including wireless; nearly all (99.9%) used email

and 80% used some type of messaging system on

a daily basis,; and over 90% routinely used technology

tools to support learning activities, including

writing papers, making presentations, etc.

Other environmental factors are also fueling

the diffusion of technologies in the learning context.

The increased emphasis on Science, Technology,

Engineering, and Mathematics (STEM)

education has encouraged the use and adoption of

technology at all levels of education. Educational

institutions have continued to invest billions of

dollars in information technology hardware,

software, education, and support (Gilbert, 1995;

Geoghegan, 1994; Olsen, 2003). Teachers at all

levels—pre-service and in-service—are expected

to embrace technology and to integrate emerging

technologies into their teaching (NCATE, 2006).

Similarly, faculty members at post-secondary institutions

are being encouraged to apply technology

in a fast changing learning environment. At

the same time, students are arriving with varying

technology ability levels ranging from near illiteracy

to extreme sophistication, which may be a

reflection of the unequal distribution of income,

resources, and opportunities.

Despite the challenges and complexity of

today’s educational environment, there has been

some obvious progress in the adoption and utilization

of technological innovations in teaching

and learning, including delivery of instruction

using approaches that appeal to the different

senses, increasing students’ self-expression and

motivation, applying cooperative and active

learning methods, making gains in student communication

skills, and engaging in multicultural

education (Barron & Orwig, 1993). Emerging

technologies have also brought about innovation

and flexibility in instructional delivery systems

resulting in improved online and distributed

learning, mobile computing and learning, engagement

in multimedia instruction, use of wireless

communication, and an increase in interactive

and collaborative instructional tools. These

outcomes have influenced many institutions to

hire more instructional technologists (Surry &

Robinson, 1996) as part of a strategy to use technology

to support improved learning.

Research studies have documented the impact

of technology on student learning. In addition,

there are anecdotal descriptions of learning

gains as a result of technology use in instruction.

Faculty members who use technology in teaching

admit that there are benefits which may not

be perceived when measuring student learning

outcomes. Such benefits include making available

a wide range of resources outside the

traditional classroom, making provisions for

individual learning styles, providing instructional

alternatives, improving student motivation,

and equipping instructors with a variety

of new teaching tools (Dyrli & Kinnaman,

1994). Technologies have

provided faculty members

new tools for teaching and

have engaged students

as they learn or interact

among themselves, with

the instructor, and with

instructional materials,

which are some of the intended

outcomes (Mars &

Ginter, 2007; Peluchette &

Rust, 2005).

With technologies

becoming prevalent in

schools and in society,

many students arrive on

campus expecting learning technologies such

as presentation programs, communication

and interaction technologies, and computer

labs. The Internet; wireless technologies; and

online, hybrid or Web-enhanced courses are

becoming the norm on campuses (Kiernan,

2003, 2005). Faculty members influenced by

the wave of technological innovation and the

accompanying expectations are embracing different

technologies. Many of these benefits are

part of intended outcomes of adopting and using

technology. However, there are also resulting

effects that are not planned or welcome in

the learning environment.

***Innovations and the change process***

The issue of the impact of an innovation

on the change process within a system is not

new (Bates, 1997; Dooley, 1999; Fullan, 1991;

Senge, 1990; Tyeck & Cuban, 1995). When new

technologies and instructional innovations are

adopted in teaching and learning environments,

every effort is made to use them to meet

the intended purposes of improving instruction

and student learning. However, these innovations

typically set off a chain of actions or

reactions within educational systems, some of

which are intended and expected while others

are unintended and unexpected. This is not to

suggest that adopting new technologies for the

purposes of improving instruction has only

negative effects or should be avoided. Rather,

we suggest there are unintended effects that accompany

the adoption of technological innovation,

in many cases without warning. Increasingly,

these effects are leading to new classes of

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disruptions and distractions in both virtual and

face-to-face instructional situations.

Educational institutions, academic departments,

and even individual faculty who adopt

technological innovations for instructional

improvement do not think initially of the unplanned

effects of technology.

Zaltman and Duncan

(1977) define innovation as

“any idea, practice, or material

artifact perceived to be

new by the relevant unit of

adoption” (p. 12).Blumenfeld

et al. (2000) suggest

that new solutions to problems

could result in unexpected

consequences, or in

fact, create problems that

did not previously exist.

According to Norton

(2002), the law of unintended

consequences is

at work all the time and

in every place. The unintended

consequences, in

the social context of the environments beig discussed

here may not be attributed to flawed implementations

of innovation adoption (Hall &

Hord, 1984) or resistance to change by people

who work in educational institutions (Zaltman

& Duncan, 1977).

***The Law of Unintended Consequences***

One of the earliest works on the concept of

unintended consequences was done by Merton

(1936) who identified the causes of unintended

consequences as ignorance, error, immediacy

(an interest or willingness to obtain immediate

results which may overshadow long-term interests

or cause adverse effects to be ignored), basic

values (which may require or rule out some

actions), and self-defeating prophecy (seeking

solutions before problems are identified). Portes

(2000) believes that a lack of careful and sustained

analysis of the social context and its participants

is likely to yield unexpected outcomes which result

from 1) the original goal not being apparent

to all participants, 2) some of the participants’

actions having significant consequences other

than those of the original goal, 3) outside influences

that transform the original goal, 4) outside

influences that transform the original goal to a

contrary outcome, or 5) the original goal being

achieved by fortuitous events. Unintended consequences,

in summary, result from a failure to

comprehensively examine and understand the

context, resulting in an inability to anticipate alternate

outcomes. There are, however, instances

when the cause of an unintended consequence

cannot be easily identified or explained.

While unintended consequences may sometimes

have negative effects, they may also lead to

unexpected benefits. For instance, there are cases

where a drug developed for a particular disease

is found to be more potent in curing another disease,

or, over time, the drug is found to be deleterious.

These outcomes were not the intended

results in the manufacture of the drug. Negative

or positive effects of unintended consequences

also apply to the adoption of technological innovations

in teaching and learning. Regardless of

the type of unexpected outcome, additional impacts

or unresolved negative effects could marginalize

any benefits that may have accrued from

the introduction of the technological change.

***Unintended Results of Technology Applications***

The issue of unintended effects of technology

applications is crucial because they can cause

disruptions or distractions in the classrooms,

labs, lecture halls, and even outside the traditional

classrooms. While computers have been

provided in classrooms and labs for instructional

purposes, students have been known to use

them while classes are in session for instant messaging

with their friends, sending and receiving

emails, paying bills, shopping online, downloading

and using copyrighted content, surfing

the Web, and even playing computer games. In

some open labs, students download objectionable

materials in the full gaze of other lab users.

The same scenarios are repeated when students

bring their laptops to the classrooms. A visitor

to such classes may think that the students are

busy taking notes or completing tasks on their

computers without knowing that the contrary

is the case. Instructors cannot be close enough

to their students’ computers to determine what

the students are doing during class time and the

amount of time they are spending on unrelated

activities. Such distractions prevent students

from paying full attention and from benefiting

from classroom instruction.

The cell phone is an important, convenient,

timesaving, and popular communication tool

available to millions of people who carry them

everywhere today. But in the classroom they

could constitute a nuisance or a source of distraction.

The ringing of cell phones in classrooms

is a well known annoyance (Campbell,

2006; Campbell and Russo, 2003; Gilroy, 2004).

Instructors can lose their train of thought in that

instant and the attention of other students is diverted.

Depending on the perceived importance

of the call, a student may even leave the class to

take or return the call. The class will not stop for

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such a student, who will likely miss some crucial

points. In large classes, students are tempted to

answer a call and talk in low tones, which is distracting

to those around. Cell phones have been

used by students to cheat on exams by calling or

text messaging friends for help.

Cell phones equipped with digital cameras

take problems to a different level. A student may

pretend to be talking or examining the phone

while instead recording still or moving images

of unsuspecting students or the instructor without

permission. In an examination environment,

they could use the phone camera to take pictures

of their neighbors answer sheet or to examine

their paper work. This technology can lead students

and faculty to wonder who may be watching

and recording their activities, their work, and

other information, without warning.

Podcasting technology is quickly gaining

popularity as a portable learning tool which enables

students to go over class materials at their

own time and wherever they are (Cassey, 2007;

Huntsberger & Stavitsky, 2007; Read, 2006, 2007;

Skiba, 2006). An interesting trend is that, rather

than use podcasting as a supplement to class instruction,

students are seeing the technology as

a substitute for class attendance (Jensen, 2007).

Other unintended results include the impact on

student-teacher interaction (Sull, 2005); additional

costs to institutions to provide classroom

technology; issues related to contracts with third

parties, copyright, and intellectual property

ownership; and not being able to predict and/or

control where content will end up and how it will

be used (Read, 2007; Skiba, 2006).

Though technology provides students the

convenience of taking classes from almost anywhere,

it has also generated some unintended

results. While the numbers of students learning

online is increasing, the number of those

“e-escaping” is equally high. Being in an isolated

environment with few or no personal contacts

seems to make it easier for students to drop out

of courses. The online learning environment

makes it possible for students to take quizzes

online, and at the same time, makes it easy for

students to cheat. The question most frequently

asked is “who is taking the quiz”—is it the student

or someone else? The Web and Internet enable

students who want to cheat to have someone

else take or help with the quiz or email test questions

to anyone who can help. Similarly, students

have found it easy to download papers they find

on the Internet or connect with others who will

work on their assignments.

Students’ use of technologies for other than

intended purposes can drastically reduce the

time they would have spent concentrating in the

classroom or studying on their own. When individuals

shift their attention from one task to

another, their brains need some time to adjust

to the new task, thereby causing them to lose

concentration on the initial task. When used

in unapproved ways in the classroom, the technologies

become distracting and create a barrier

between the student and the instructor.

Another unintended effect of the adoption

of technological innovations is the widening

gap that it creates between the technology

haves and have-nots. While some institutions

can boast of the latest and the fastest in their

acquisitions and enhanced skills in the use of

technology, there are still many who are lagging

behind. There are students and faculty who are

not at par with their global counterparts in

the acquisition and use of technologies. While

the purpose was to use technology to improve

teaching and learning, the have-nots are further

distanced from the benefits of technology

use. In the traditional classroom environment,

such problems are minimized.

The use of certain instructional technologies

introduces the unintended result of redefining

the role of instructors. As practitioners

combine the use of constructivist learning

principles and critical thinking strategies with

course delivery systems such as the learning/

course management systems in learner-centered

online environments, the role of the instructor

often shifts from

teaching and lecturing to

that of a facilitator. While

the intention is to equip

faculty with relevant teaching

tools, the unintended

outcome is that it reshapes

their traditional roles. In

some instances, instructors

take up the added responsibility

of guiding their

students through technology

literacy and providing

low levels of technology

support in online environments.

Instructors are also

finding out that the application

of technology to

their courses does not come cheap in terms of

monetary costs and development time.

While the issue of unintended consequences

of the use of instructional technologies seems

enigmatic, consideration of systems and change

theories could help to better understand and

appreciate this phenomenon, enabling early

detection of unintended effects and the ability

to plan for appropriate interventions.

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**Systems Theory**

One of the earliest proponents of

the systems theory was Ludwig von

Bertalanffy who saw it as a better way

to describe the make-up and functions

of organic systems. He defined

systems as “sets of elements standing

in interaction” (Bertalanffy, 1968,

p. 38). According to systems theory,

systems are characterized by the interrelatedness,

interconnectedness,

nestedness, and dynamism of the

parts that make up the whole (Gustafson

& Branch, 2002; Hutchins,

1996). When change is introduced in

one part of the system, which is the

whole, that change is likely to affect

the other parts because of the symbiotic

relationship of all parts of the

system that support normal functioning

and maintain the necessary

equilibrium.

Daft and Baker describe change

as the “adoption of something different”

(1978, p. 4). Innovation follows

the early adoption of a change

(Knight, 1967). Technological change

is affecting the whole system of higher

education in recent times, and carries

with it some side effects. According

to Postman, “for every advantage any

new technology offers, there is always

a corresponding disadvantage” (1995,

p. 193). Understanding the dynamics

of systems provides some insight into

why the adoption and utilization of

technology for instructional purposes

can affect all the parts of a system,

whether it is a university, college,

school district, or even a department

within an institution. It can be difficult

to comprehend or even imagine

early in the adoption process the side

effects or unintended consequences

of introduced change, such as emerging

technology in a given instructional

environment.

**Chaos Theory**

Chaos theory refers to underlying

patterns in the apparent randomness

or chaotic behavior of unpredictable,

complex, and dynamic systems.

Like systems theory, chaos theory has

some effect in managing for unintended

consequences. The “Butterfly

Effect”—an important idea in chaos

theory—refers to the notion that in

a chaotic system, slight disruptions

can sometimes lead to vital changes

throughout the entire system. In most

cases and under certain circumstances

a slight disruption in the system will

not make any difference at all; however,

when the system becomes unpredictable,

the system and its future may

be impacted significantly. Chaos theory

suggests that organizations could

be viewed as complex, dynamic, and

adaptive systems with characteristics

that resemble those that obtain in nature,

exhibiting stages of stability and

chaos. In the adoption and application

of technology to improve teaching

and learning, any slight change in

a complex educational system, institution,

or department could initiate

or deepen the effects of unintended

results.

**Minimizing the Problem of**

**Unintended Consequences**

While the issues of unintended

consequences that result from the application

of new technology in learning

environments could be managed

or minimized, it may not be possible

to precisely predict or completely

eliminate them. The timing, extent of

influence, and nature of unintended

outcomes are hard to predict. Students

often find creative ways of using technology,

other than the intended ones.

However, lessons from the implementation

of systemic change could help

manage unintended results of technology

application and minimize the

effects. One approach to take in the

adoption of technological or instruc-

*“Stakeholders who*

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tional innovations is to think first of

the institution or the environment

where the technology is being used

as a system and how possible changes

will affect that system. Recognize that

adding new technologies or innovations

to an existing organizational

structure could be a potential cause

of disruption. A common problem in

educational institutions in the adoption

of technologies or innovations is

to ignore or to leave the existing system

in its original form while adding

to that system. Such an approach fails

to acknowledge the impact of the adopted

technologies on an old system

that may have worked better with older

technologies. Unintended consequences

may result in changes failing

to take root as the adoption process

did not take into consideration the relationships

between the different parts

of the institutional system. This does

not advocate discarding existing systems,

as some parts of the old system

may still work well with the change

that is being introduced. Proper assessment

prior to adopting an innovation

and monitoring the system for

the effects of change after the adoption

of innovation are essential.

In the learning environments,

whether traditional classroom or virtual

learning environment, prompt intervention

by the technology support

group or faculty to provide solutions

will help prevent problems. While the

focus of the IT group is on technological

solutions to unintended effects,

faculty members can develop rules

of engagement in the classrooms. For

instance, faculty members could provide

cautions in their syllabi regarding

the proper use of electronic devices in

the classroom. Such guidelines should

also include standard warnings about

cheating on assignments or tests, acceptable

classroom behavior, and institutional

policies.

As many campuses go wireless

and more technologies find their way

into learning environments, it may

be important to develop orientation

sessions for faculty and incoming students

on acceptable technology-use

practices and web and Internet etiquettes.

Rather than curtail or eliminate

the use of technology for instrucVolume

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tional purposes, providing guidelines

for proper use will help to prevent

students from unapproved use of

technologies.

Defining the purpose and desired

outcomes for the technology

that is intended for adoption will

help to alert campus constituencies

when unintended outcomes begin to

emerge. While it will not eliminate

all unplanned results of technology

adoption, it can help with early identification

of instances of unintended

outcomes. Similarly, planning for the

adoption of the technology within the

context of systemic change will help

minimize unintended results. Following

principles espoused by eminent

scholars in the adoption of innovation

and managing change could be beneficial.

Recommended reading includes

Ely (1990, 1999); Hall & Hord (1984);

Havelock & Zlotolow (1995); Rogers

(1995), Surry & Farquhar (1997);

Surry & Ely (2006); and Zaltman &

Duncan (1977).

Early buy-in from faculty, administrators,

campus technology groups,

and other users within the institution

in the adoption of innovations gives

them some level of ownership and enables

them to participate in the adoption

process, change management,

and problem solving when unexpected

outcomes result. Stakeholders who

are not involved at the onset in the

adoption process will not see themselves

either as part of the problem

or part of the solution, and, therefore,

may not be willing to participate in interventions

or solutions to identified

problems.

Some institutions and technology

developers have found solutions to

negative unintended consequences as

they are identified. For example, technologies

are now available to control

computers in a lab while the instructor

is demonstrating some points, thereby

making it impossible for students

to surf the Web or send and receive

emails. Other technologies can prevent

or drastically minimize cheating

when students are taking online quizzes

by making it difficult for students

to send or receive instant messages,

surf the web, send or receive email,

open other programs or files while the

test is on, or print test questions while

students are still taking online quizzes.

The protection is provided without

altering the test question format,

disrupting systems security, or affecting

the delivery of the test materials.

In addition to technology-based solutions,

instructors can specify in their

syllabuses if and when students need

their laptops in the classrooms and

can also enforce the guidelines to ensure

students are sensitive to and adhere

to stipulated classroom etiquette.

Unexpected consequences may be

remedied when identified early.

**Conclusions**

It is possible to perceive the inclass

use of technologies for other

than instructional purposes as innovative

use of technology or multitasking

by the students, rather than

a distraction. The problem, however,

is that it occurs when the attention

of students should be on class activities,

to reflect on the instruction, or to

complete specific assignment. Engaging

in non-class related technology

applications during class may suggest

that students are inattentive or are not

engaged with relevant tasks or activities

in the learning environment. Issues

of hacking into the systems to

change grades, watching videos in

class, using the devises to cheat, surfing

the Web, paying bills, shopping

online, checking the weather, reading

breaking news, playing video games,

etc. using hand-held technology devises

or laptop computers could be

a impediment in learning and could

create a wall of separation between

the student and the instructor.

Despite unintended consequences,

the application of technology in

the teaching and learning process

has merits. Technology has equipped

teachers with innovative tools for use

in the virtual and face-to-face learning

environments and has provided

learning options for students. Beyond

the results of media comparison studies

and the no-significant-difference

findings, there are many benefits in

the use of technologies in instruction.

It is important to reiterate that this

discussion has not intended to focus

on the advantages or disadvantages

of adopting innovations or applying

technologies to instruction. The purpose

is to draw attention to the need

to constantly remember the effects of

change in any system and the possibility

of unintended consequences,

and the need to plan to avert negative

consequences where possible or plan

for prompt response to minimize any

serious effects. Identifying unintended

effects early is crucial as negative

consequences may become more pronounced

over time.

*John Nworie is the Director of the Center for*

*Innovation in Teaching and Learning at Fayetteville*

*State University, a constituent institution*

*of the University of North Carolina system.*

*He completed his PhD program in Instructional*

*Systems at the Pennsylvania State University,*

*with a doctoral minor in Adult Education and*

*a graduate certificate in Distance Education.*

*Dr. Nworie has published and presented at national*

*and international conferences. He recently*

*co-authored a publication in EDUCAUSE*

*Quarterly with Dr. Michael Albright, entitled*

*“Rethinking Academic Technology Leadership*

*in an Era of Change,” that was selected as*

*EQ’s 2008 Contribution of the Year and will be*

*honored at the EDUCAUSE annual conference*

*in October 2008. His areas of interests include*

*distance education, faculty professional development,*

*scholarship of teaching and learning,*

*leadership of academic support services, and*

*technology application to instruction.*

*Noela A. Haughton is an Assistant Professor of*

*Education and the NCATE Assessment Coordinator*

*for the Judith Herb College of Education*

*at the University of Toledo. She completed her*

*graduate work at the Pennsylvania State University*

*in Instructional Systems with a supporting*

*field of Assessments. Her research interests*

*include accreditation and assessments and*

*technology-supported assessment and learning*

*systems.*

**References**

Adams, D. (2006). Wireless laptops in the

classroom (and the Sesame Street syndrome).

*Communications of the ACM*,

*(49)*9, 25-27.

Banathy, B. H., and Jenlink, P. M. (2004). Systems

inquiry and its application in education.

In D. H. Jonassen (Ed.) Handbook of

Research on Educational Communications

and Technology (p. 37- 57). Mahwah, NJ.:

Lawrence Erlbaum.

Barron, A. E., & Orwig, G. W. (1993). *New*

*technologies for education*. Englewood, CO:

Libraries Unlimited.

58 **TechTrends • September/October 2008** Volume 52, Number 5

Bates, A. W. (1997).The impact of technological

change on open and distance learning.

*Distance Education, 18*(1), 93-109.

Bertalanffy, L. von. (1968). General systems

theory: Foundations, Development, Applications.

Revised edition. New York: George

Braziller.

Blumenfeld, P., Fishman, B. J., Krajcik, J., &

Marx, R. W. (2000). Creating usable innovations

in systemic reform: Scaling up technology-

embedded project-based science in

urban schools. *Educational Psychologist,*

*35*(3), 149-164.

Campbell, S. (2006). Perceptions of mobile

phones in college classrooms: Ringing,

cheating, and classroom policies. *Communication*

*Education, (55*)3, 280-294.

Campbell, S. W., & Russo, T. C. (2003). The

social construction of mobile telephony:

An application of the social influence model

to perceptions and uses of mobile phones

within personal communication networks.

*Communication Monographs,70*, 317-334.

Cassey, M. (2007). Using technology to let

your voice be heard. *Nursing Economics,*

*(52)*4, 230-232.

Daft, R. L., & Becker, S. W. (1978). *Innovation*

*in organizations: Innovation adoption*

*in school organizations.* New York: Elsevier

North Holland.

Dooley, K. E. (1999). Towards a holistic model

for the diffusion of educational technologies:

An integrative review of educational

innovation studies. *Educational Technology*

*& Society, 2*(4), 35-45.

Dyrli, O. E. & Kinnaman, D. E. (1994). Gaining

access to technology: First step in making

a difference for your students. *Technology*

*& Learning, 14*(4), 16-20, 48, 50.

Ellsworth, J. B. (2000). Surviving change: A

survey of educational change models. Syracuse,

NY: ERIC Clearinghouse on Information

and Technology.

Ely, D. (1990). Conditions that facilitate the

implementation of educational technology

innovations. *Journal of Research on Computing*

*in Education, 23*(2), 298-305.

Ely, D. P. (1999). Conditions that facilitate the

implementation of educational technology

innovations. *Educational Technology (39)*,

23-27.

Fullan, M. (1991). *The new meaning of educational*

*change.* New York, NY: Teachers College

Press.

Geoghegan, W. H. (1994). *What ever happened*

*to instructional technology? (Reaching*

*Mainstream Faculty)*. Paper presented at

the 22nd Annual Conference of the International

Business Schools Computing Association,

Baltimore, MD.

Gilbert, S. W. (1995). Education technology

and transformation. *Community College*

*Journal, 66*(2), 14-18.

Gilroy, M. (2004). Invasion of the classroom

cell phones. *Education Digest, (69*)6, 56-60.

Gustafson, K. L., & Branch, R. M. (2002).

What is instructional design? In R. A Reiser

& J. V. Dempsey (Eds.). *Trends and issues in*

*instructional design and technology*. Upper

Saddle River, NJ: Pearson Education.

Hall, G. E., & Hord, S. M. (1984). *Change in*

*schools: Facilitating the process.* Albany: State

University of New York Press.

Havelock, R., & Zlotolow, S. (1995). *The change*

*agent’s guide* (2nd ed.). Englewood Cliffs,

NJ: Educational Technology Publications.

Huntsberger, M., & Stavitsky, A. (2007). The

new “pedagogy”: Incorporating podcasting

into Journalism Education. *Journalism &*

*Mass Communication Educator, 61*(4), 397-

410.

Hutchins, C. L. (1996). *Systems thinking.* Aurora,

CO: Professional Development Systems.

Jensen, M. (2007). Lecture ID dead: Take 3.

*American Biology Teacher (69)*3, 138.

Kearsley, G. (1998). Educational technology:

A critique. *Educational Technology (38)*2,

47-51.

Kiernan, V. (2005). National Science Foundation

tallies colleges’ net connections. *The*

*Chronicle of Higher Education (51)49*, 35-

35.

Kiernan, V. (2003). A survey documents the

growth in distance education in the late

1990s. *The Chronicle of Higher Education*

*(49)48*, 28-28.

Knight, K. (1967). A descriptive model of

intra-firm innovation process. Journal of

Business, 40, 479-96.

Mars, M., & Ginter, M. (2007). Connecting organizational

environments with the instructional

technology practices of community

college faculty. *Community College Review*

*(34)*4, 324-343.

Merton, R. K. (1936). The unanticipated consequences

of purposive social action. *American*

*Sociological Review (1)*6, 894-904.

Merton, R. K. (1976) *Sociological ambivalence*

*and other essays*. New York: Free Press.

National Council for the Accreditation of

Teacher Education. (2006). Guidelines and

procedures for the NCATE program review

system. Retrieved July 17, 2008, from

http://ncate.org/institutions/guidelinesProcedures.

asp?ch=90

Norton, R. (2002). Unintended consequences.

In D. R. Henderson (Ed.), *The Concise Encyclopedia*

*of Economics, The Library of Economics*

*and Liberty.* Indianapolis: Liberty

Fund.

Office of Technology Assessment. (1995).

Teachers and technology: Making the connection,

(OTA Publication No. 052-003-

01409-2). Pittsburg, PA: Superintendent of

Documents.

Olsen, F. (2003). Colleges expect to increase

information-technology spending by 5 percent.

*Chronicle of Higher Education.* WWW

document. Retrieved January 02, 2008,

from http://chronicle.com/free/2003/03/

2003032601t.htm

Peluchette, J., & Rust, K. (2005). Technology

use in the classroom: Preferences by management

faculty members. *Journal of Education*

*for Business (80)*4, 200-205.

Portes, A. (2000). The hidden abode: Sociology

as an analysis of the unexpected. *American*

*Sociological Review (65),* 1-18.

Postman, N. (1995). *The end of education.*

New York: Alfred A. Knopf.

Read, B. (2007). How to podcast lectures.

*Chronicle of Higher Education,(53)*21, 32-

35.

Read, B. (2005). Turning Campus Radio on

Its Head. *Chronicle of Higher Education, 52*,

30.

Rogers, E. M. (1995). Diffusion of innovations

(4th ed.). New York: The Free Press.

Salaway, G., Katz, R., Caruso, J. B., & Kvavik,

R. B. (2006, December). The ECAR study

of undergraduate students and information

technology. *EDUCASE Quarterly (7).*

Senge, P. M. (1990). *The fifth discipline: The*

*art and practice of the learning organization.*

New York: Doubleday

Skiba, D. (2006). Think spots: Where are your

learning spaces? *Nursing Education Perspectives*

*(27)*1, 54-55.

Sull, E. (2005). Podcasting lectures and more.

*Chronicle of Higher Education, 52*, 14.

Surry, D. W., & Ely, D. P. (2006). Adoption,

diffusion, implementation, and institutionalization

of educational innovations. In R.

Reiser & J. V. Dempsey (Eds.), *Trends and*

*issues in instructional design and technology*

(2nd ed.) (pp. 104-111). Upper Saddle

River, NJ: Prentice-Hall.

Surry, D. W., & Farquhar, J. D. (1997). Diffusion

theory and instructional technology.

*Journal of Instructional Science and Technology,*

*2*(1). [On-line] Available http://

www2.gsu.edu/~wwwitr/docs/diffusion/

index.html

Tyack, B., & Cuban, L. (1995). *Tinkering toward*

*utopia: A century of public school reform.*

Cambridge, MA: Harvard University Press.

Young, J. (2005). Stanford University makes

podcasts of lectures available through Apple’s

iTunes. *Chronicle of Higher Education*

*(52)*11, A44.

Zaltman, G., & Duncan, R. (1977). *Strategies*

*for planned change.* New York, NY: John

Wiley and Sons.