Distant, On-line Education: Effects, Principles and Practices

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ABSTRACT

The purpose of this paper was to identify the characteristics and history of online education, to examine research on the effectiveness of online learning, and to note the principles and practices indicated for maximizing the effectiveness of online learning. Leading articles and studies on online education were identified and examined for this literature review. Historically, online education is located within a longer tradition of distance education.   The primary distinction between campus-based education and distance education is noted, along with distinctions between computer-assisted instruction, online learning and hybrid courses. After listing the presumed pros and cons of online education, the argument about whether online learning is technologically dependent is raised. Prototypical studies of research about online learning are examined and used to isolate fundamental problems in carrying out research comparing online vs. campus-based education. Major meta-analytic studies are then reviewed. The conclusions of these studies are several: there are wide variances in the effectiveness of both campus-based and online education; online learning is as good on average as campus-based programs; and the best format may be a hybrid or combined version. Standards for delivering online educational programs are produced as recommendations, based on integrating standards issued by different disciplinary bodies. The paper concludes with a series of issues about online education and learning that need to be addressed. (Contains 4 tables in the Appendix.)

Distant, On-line Education: Effects, Principles and Practices

Over the last 20 years, the growth of online educational programming has been spectacular, a conclusion that seems obligatory for articles dealing with online education to state. For example, Tallent-Runnels et al. (2006) noted that by the year 2000, virtually 9 out 10 institutions of higher education (both two- and four- year institutions) offered distance education programs. At that time, more than 2.8 million individuals were enrolled in college-level credit courses using on-line mechanisms. Grandzol and Grandzol (2006) observed that online enrollments for U.S. institutions grew by more than 18% (from 1.98 million to 2.35 million) between 2003 and 2004, matching growth rates over the prior three-year period. Business disciplines represented the highest levels of growth.

The purpose of this paper is to describe the theory, the research and the practice of online learning. After looking at its historical manifestations, a terminology for this field will be offered; then, the potential promise and pitfalls of distance learning will be noted. A major question that has driven this field is how online education compares to the more traditional classroom-based method. Research on that question will be addressed, including criticisms of that research. Next, through several different routes, the prescriptive guidelines for practice will be considered. The paper will conclude with questions remaining for research.

Distance Learning: History, Terms and Consequences

In spite of its apparent recent popularity, distance education methods can be traced back more than a hundred years to the 19th century when improvements in postal services paved the way for correspondence courses. Since these early days, distance educational programming can be tracked through five different stages or generations (Taylor, 2001); keep in mind that each

generation was not eliminated by the next but rather accumulated and persisted with the newly emerging versions. The five generations are:

1. Correspondence Education based on print and postal delivery. (Note: there is probably a sixth generation that should be added as really the second stage to distance education; it could be called "broadcast education" such as public television in the United States or Britain's University of the Air. Taylor puts mass broadcast radio and television programs in the third generation, but this is both a faulty timeline and classification; public television in the United States, appearing in the 1950's and 60's, was used to broadcast educational programming a good 20 years before various teleconferencing modalities were available. See History of public broadcasting, n.d.; Shane, 1989.)

2. A Multi-media model that combined print, audiotape, videotape and computer-disc technologies; here, learners purchased the material, then read and completed any activities (perhaps with feedback) on their own. An example would be learning a foreign language by playing a tape in one's car's radio player with a workbook provided.

3. The Tele-learning model of synchronous communications using available technologies, like videoconferencing, to provide educational programs.

4. The Flexible Learning model that used interactive media delivered through the internet for online delivery; this included computer-mediated communications.

5. The current, fifth generation is a so-called Intelligent Flexible Learning model. The main offered difference between this and the fourth generation involves "campus portal access to institutional processes and resources...[that provides] a customizable e-interface [through which] students, staff, and other stakeholders can" interact with the University (Taylor, 2001, p. 10). Apparently, this involves allowing 24-7 interactivity by students with essentially all components

of the University. It was with the popular diffusion of personal computers in the 1980's, soon

enough linked by the Internet, that spurred the last stage of distance education, or what we now

think of as on-line learning programs.

Terminology and Types

Given this variegated legacy, it is necessary to use a consistent terminology. *Distance*

education (DE) is the most encompassing term that refers to educational practices whereby the

instructor is physically and geographically separated from students so that instruction must occur

through some form of media, be it print and mail, radio, television, computers, or otherwise.

Further, different kinds of delivery vehicles can be identified, such as correspondence courses

that distributed printed texts through the mails; television; and now Web-based approaches

(Shachar and Neumann, 2003). Within the framework of Web-based education, several

additional distinctions can be identified (Tallent-Runnels et al., 2006). *On-line courses* are those

that are delivered completely through the Internet, while *hybrid or blended courses* combine

online with traditional classroom instruction. When Web-based courses use specific,

transaction-mediating software, that is *e-learning*. (Presumably, courses could be delivered

through the Internet using e-mail but without benefit of some kind of educational, online

software, such as Blackboard.) It is likely that, today, most online courses use some sort of

educational transaction software, so for this paper, E-learning courses will be called online.

Distance education can also be distinguished from classroom-based, traditional, face-to-

face (f2f) education (terms used interchangeably here) and from *computer-assisted instruction*

(CAI; also computer based training or CBT). In CAI, instructional modules are programs

embedded in a computer. These programs involve predetermined tutorial instruction segments

as well as drill-and-practice exercises; more enriched versions may include graded evaluations of performance along with additional feedback or guidance for problem-solving. There is interactivity between the instructional and testing elements of the program and the student. These instructional experiences are typically done by the individual, rather than in a group format. In short, CAI instruction is particularly suited for tutoring, drill-and-practice, and testing. A 1991 meta-analysis of 254 studies of computer-assisted instructional programs was conducted by Kulik and Kulik. They found that CAI students had significantly more learning (0.3 standard deviations higher) than students in conventional classrooms.

> We conclude, therefore, that the typical student in an average CBI (computer-based instruction) class would perform at the 62nd percentile on an achievement examination, whereas the typical student in the conventionally taught class would perform at the 50th percentile on the same examination. Put another way, the average student from the CBI class will outperform 62 percent of the students from the conventional class. (p. 80)

Interestingly enough, the stronger effect sizes occurred with programs whose length of time was no longer than four weeks; that is, learning effectiveness decreases with the increasing length of time of CAI usage in a class.

One other distinction that is common in classifying programs is the extent to which they are *synchronous* (instructors and students are communicating online simultaneously or at the same time) or *asynchronous* (where there is no immediate communication taking place).

On-Line Learning: Arguments Pro and Con

During the period of time over which online education has evolved, numerous claims about the benefits or advantages of online education have been offered. Likewise, there been numerous disadvantages noted (Grandzol and Grandzol, 2006). For example, the following advantages of online education have been suggested:

- Improving the technical literacy of students

- Minimizing projected shortages in instructors

- Alleviating overcrowding and/or reduced investment in college physical plants

- Increasing enrollment and profits

- Creating a more friendly learning environment

- Allowing students to work at their own pace

- Extending geographic reach and presence of an institution

- Improving graduation rates

- Reducing costs associated with commuting and other work demands.

    These anecdotally noted advantages have been contrasted to these disadvantages:

- Poor quality of instruction

- Training costs for faculty

- Evoking faculty resistance to change

- Lack of student-teacher interactions

- Employer skepticism

- Increased faculty workloads

- The inappropriateness of the medium for teaching certain types of course content

- Problems in technology and administration

- Loss of scholarly control.

DE: Technology Neutral or Technology Dependent?

    Given the many conveniences and economies that DE courses promise, interest in the

relative effectiveness of distance education has provoked both researcher and critic. Clark

(1994) took an early position in this debate, contending that technological media, including

computers and the Internet, are relatively inconsequential in their effects on learning, particularly

compared to more powerful factors like instructional methods and individual learner differences.

That is, there are really two kinds of technologies involved: *instructional technologies* use

social-psychological research in organizing content into instructional programs in order to

produce learning, while *delivery technologies* focus on providing efficient and timely access to

those instructional packages. Delivery technologies affect the cost and access to instructional

material, but do not have an independent effect on the quality of instructional programs.

Moreover, he criticized research comparing DE and face-to-face instruction on several counts.

Most studies, for example, do not have adequate experimental controls to rule out competing

explanations of outcomes. Further, he argued that there may be unique institutional practices for

different media, and studies typically do not isolate those unique instructional factors. In

summary, for Clark, technology is neutral and not determinative of learning outcomes.

This argument butts against the question, not of learning efficacy per se, but rather the

situational or domain suitability of online learning in the context of certain types of occupations.

Specifically, the American Association of College of Nurses (2000) wonders how well online

learning prepares students for the social and behavioral skills needed in a field noted for its

people-intensive work: "Can students learn to relate well in a multi-disciplinary environment

when their dominant educational experiences have been technology-based, essentially isolated

from classmates and teachers except for telecommunications?" (p. 3). This question has not

been adequately researched. A fundamental issue is the extent to which fields that involve

people-intensive tasks actually require direct, on-going, interpersonal contact with others

(faculty and classmates). Alternatively, if the nuances of reading and responding to others can

be clearly identified (my guess is that such a listing of the social and behavioral skills associated

with people-intensive work has not adequately been performed), can those skills be taught using

online mechanisms? The default assumption – what should be a hypothesis – is that they cannot.

Traditional Vs. Online Education: How Do They Compare?

While studies comparing traditional versus other forms of distance education go back a

number of years, there is been a consistent and growing body of research since the early 1980's

that has addressed the fundamental questions about whether on-line education is as good as

traditional, face-to-face instruction. The study by Dellana, Collins and West (2000) is

illustrative of the typical research paradigm used. Two sections of the same quantitatively-

oriented management science course were compared. This course, typically taken by junior

level students, was taught by the same instructor, and covered the same content with

approximately equal class size and instructional approach. The traditional version was taught in

a lecture format with Power Point visuals, while the on-line course presented the same material

online to students who could not or wished to avoid attending the classroom lecture. The on-line

portion of the course included lecture material with Power Point format along with a discussion

room and e-mail. There was a total of 221 participating students (70 in the traditional course

format); 7% of students in the traditional course dropped out vs. 11% in the Online version. All

exams for both sections were given in an on-campus classroom. There was no statistically

significant difference between the traditional and the online versions on average scores.

Several items of note about this study illustrate issues throughout this stream of research.

First, there are several internal threats to the validity of this study. (Threats would be any flaws

in the research design that could explain the obtained result apart from the stated independent

variable of the course delivery vehicle.) For example, students were not randomly assigned to the different conditions but rather self-selected the instructional format they would use. Thus, one cannot rule out preexisting differences as accounting for some of the differences in the scores; that is, people would select the option that is best for them. (In general, this issue raises the possibility that there can be an aptitude-treatment interaction at work, the practical implication of which is that students may need to be either prescreened for participating in online classes and/or students given a choice as to the type of venue they use.) Another potential threat might involve differences in instructor experience doing in-class v. online programs. That is, an instructor who is extremely versed in classroom teaching could presumably offer a different quality learning experience than if he had to do the same course online and for which his experience was limited (Anstine and Skidmore, 2005). In the Dellana, Collins and West (2000) study, the instructor had been involved for many years in providing distance education programs, so experience level could have been ruled out here; even so, the potential threat remains.

Second, the attempt was to make the on-line class as much of a duplicate of the regular traditional course as possible. This is an important issue which will be addressed again. For now, the question is whether this is a fair basis for comparison. A draft horse could be fairly compared to other draft horses but would be unfairly compared to race horses. In other words, is an online, computer and web-based learning process really the same as a classroom process (obviously, minus the physical presence of an instructor) or is the online process a different "animal"? Hypothetically, how is the quality of each course delivery technology rated? Is a low quality lecture being compared to a high-quality on-line course? Alternatively, simply duplicating classroom instruction onto an online form does not insure that the online form is the

best possible structure for online delivery. Indeed, in this context, duplication may produce

misleading outcomes.

Third, in terms of the reporting of these studies, the description of the specific techniques

used in both the online and the traditional classroom methods leaves much to be desired. The

classroom method was defined as a lecture format but did this mean a virtual non-stop

presentation by the instructor? How much student interaction -- with each other, with the

instructor -- was there? Were there ever class exercises or activities? Likewise, what happened

in the online sessions was only broadly explained. At issue here is difficulty in interpreting what

the actual treatments (class experiences) really were. In short, how different were the treatments

and in what significant ways? Without a much more detailed explanation, it is hard to evaluate

what is being compared.

Fourth, test grades were used as the basis for comparison. While this is imminently

understandable, issues remain in several ways. For example, using Bloom's (1956) hierarchy of

learning outcomes, it is possible for tests to sample different levels of complexity of knowledge

and cognitive processing, from simple recall of isolated facts to much more nuanced evaluation

and analysis. The latter pole would ask about the extent to which critical thinking is being

advanced. Tests likely include items from across the spectrum of learning outcomes, but an

issue is whether there are any differences in effects of either form of instruction in terms of

testing levels. There is also the issue of subject domain. In the Dellana, Collins and West (2000)

study, the subject matter was technical in its nature: there were clear procedures in the form of

formula applied to problems in which all needed information is provided in the text and for

which there is a single right answer. But what of other domains in which there is extensive

human interaction, for which judgment (not technical equation solving) is essential, when

information must be discovered, and when there are a variety of possible solutions of similar

costs and benefits?

Finally, the "no significant difference" finding indicated that the online instruction was as

effective as in-class instruction. As we will soon see, this basic conclusion of "no significant

differences" between the types of delivery vehicles is a consistent and pervasive baseline

conclusion. This conclusion, though, has been interpreted in several ways, all of which are

justifiable. Proponents of online education are quick to seize on the findings, pointing to the

equivalency of the techniques. Critics, perhaps relying upon implicit promises of the purported

superiority of on-line programs, point to the failure of on-line programs to deliver better results.

Thus, one's ultimate reaction to these findings will depend upon one's initial expectations.

Online v. Traditional, On-campus education: Research summaries

The number of studies comparing traditional versus online courses is surprisingly large to

an observer first visiting this field. Indeed, the number of studies is so substantial that a number

of research summaries, including several meta-analytic reports, have been produced. It is to

those reports that we turn.

An early entrant into this context was Russell (1999). As reported in Zhao, Lei, Yan, Lai

and Tan (2005), Russell cherry picked more than 350 studies, from 1928-1999, that supported

the finding of no significant differences in learning outcomes for DE sources. While this source

supported the early claim that there was no significant difference between DE and classroom

based instruction, his method neutralizes any claims that come from this analysis.

Shachar and Neumann (2003) identified 86 studies (representing more than 15,000

students) between the years of 1990-2002 that had no severe methodological flaws, included a

control or comparison group, and had sufficient quantitative data to calculate an effect size (the

difference between the means of the two sets of data divided by the pooled standard deviation of

the sample). One-third of the studies found negative results (that is, traditional instruction

outperformed online classes), while two-thirds found positive effects. Of that group, 35% found

a small effect, while the balance was either medium or large sized (19%). After combining all

analyses, a combined or pooled single effect sizes was then calculated. This overall effect was a

significant, medium effect size favoring online instruction (d+ =.366): "The final academic

performance grades of students enrolled in distance education programs are higher than those

enrolled in traditional face-to-face programs" (page 13). The authors, however, did not provide

adequate detail about the studies that they included, specifically in terms of student grade levels

or course content in the studies used. Neither did they provide, as is customary, an identification

of the specific studies that they used. Even though the results are suggestive, questions remain

about the sources of data that were used.

At least three meta-analyses, though, do deserve close attention and respect because of

their rigorous methodology and analysis. Each will be reported in turn.

The most inclusive study was conducted by Bernard and his associates (2004). They did

an exhaustive search to identify studies of Distance Education and identified 232 studies from

1985 (an arguable milestone when PC and web-based educational venues reached a level of

popularity) through 2002. DE was defined in terms of the relatively permanent separation, both

in time and space, of learner and instructor during planned learning events that were conducted

under the aegis of a recognized educational organization and that included two-way media for

dialogue and interaction between instructor and students. Further, the studies had to include an

empirical comparison of the DE format with a face-to-face (f2f) classroom format. The level of

learners (from kindergartners to adults) had to be identified, and the studies had to be just for

courses, not entire programs. Three different kinds of dependent variables were noted:

achievement outcomes (n = 321), attitudes (n = 262), and retention (n = 105). Studies were

coded in terms of a variety of features, including course design formats, media use, subject

matter, and so on. As is common in such procedures, effect sizes for each study were weighted

to create an overall estimate of average treatment effect.

Findings were presented in terms of the three dependent variable measures. First, in

terms of achievement outcomes, the data represented almost 55,000 students. In general, there

was a very small yet significant difference in achievement scores favoring DE over classroom-

based education; the difference was just slightly better than zero. At the same time, there was

large variability in outcome scores for both formats. In other words, the data indicate that some

distance education applications are much better than classroom instruction, and some are much

worse. Asynchronous distance education programs, however, were significantly better while

synchronous programs were significantly worse. Further analysis indicates that the factors that

were significantly responsible for the differences were attributable to the methodology employed

in the research (such as type of publication, type of measure, treatment duration, instructor

equivalence, class size equivalence, and so on) and pedagogical features of the instruction (such

as whether a systematic instructional design procedure was used, whether there was f2f contact

involved, the nature and amount of contact between students and/or with the teacher, or the use

of problem-based learning). Media or technology factors did not predict achievement. In short,

methodological issues -- the structure of the research -- accounted for a substantial portion of the

variance. While there were no differences between undergraduates students, graduate school

applications yielded modest, significant results in favor of DE. Face-to-face instruction was

found to be better for topics such as math, science, and engineering, while computing and

military/business topics seem to be slightly better in distance education. (Findings about people-

intensive fields of practice, like nursing, counseling, education or Human Resource

Development, were not reported.)

The research on attitudes were grouped into four categories: attitudes about technology,

the subject matter, the instructor, and the course. (Unfortunately, in this report, results were

aggregated and not reported for each category.) There were 154 attitude outcome measures

available. In general, DE was significantly associated with negative attitudes. A significant

negative difference held for synchronous but not for asynchronous DE. Again, there was a large

variance in attitude scores. And again, methodological factors accounted for the lion's share of

variance, more so, though, for synchronous courses. Retention rates were significantly lower for

online courses. Once more, there were differences between synchronous and asynchronous

courses, with the latter showing significantly more dropout rates of students.

They drew the following overall conclusions. First, there are substantial weaknesses in

the research methodologies used that substantially compromise the quality of conclusions that

can be used for policy making. Further, there was relatively little guidance that can be extracted

from this corpus of research. Second, there is wide variability in outcome measures for both DE

and f2f formats. The overall opinion that DE is better or worse than f2f courses is simply not

supportable. That is, both DE and f2f work very well, or they can work very poorly. They were

not able to isolate what specific factors might be responsible for those differences.

A second study by Sitzman, Kraiger, Stewart and Wisher (2006) found 96 research

reports from 1996 to 2005, representing more than 19,000 students in 168 courses, both

educational and work-based; 67% of the reports involved undergraduate students. They coded a

number of features of the courses included, providing a finer detailed analysis of moderator variables. The primary dependent variables were declarative knowledge (of facts and principles) and procedural knowledge and skill. In line with the prevailing conclusions of the field, "web-based instruction" was significantly but weakly more effective than traditional classroom instruction in teaching declarative knowledge. There was no evidence of differences between web-based and classroom-based instruction on procedural knowledge. Students and trainees were equally satisfied with both delivery mechanisms.

On top of these now-to-be-expected outcomes, several new findings emerged. First, the courses that combined a Web-based and classroom-based instruction (so-called "hybrid" courses) outperformed either method separately on both declarative and procedural knowledge. Indeed, hybrid courses were more effective for teaching procedural knowledge. Other important moderating variables included the amount of learner control, practice and feedback included in the course. Specifically, when Web-based courses allowed higher levels of control, practice opportunities and feedback to students, the effect of web-based instruction was strong compared to classroom instruction. Interestingly enough, human interaction had no effect in distinguishing web-based from classroom-based instruction. Students and trainees tended to react more favorably to stand-alone classroom instruction than to hybrid programs. Finally, in the few studies (n=11) in which learners were randomly assigned to instructional conditions, classroom-based instruction was more effective. They observed that there may easily be a person-treatment interaction effect; that is, when people self-select the mode of instruction, they are likely to pick the method in which they feel most comfortable and competent.

The third meta-analysis by Zhao et al. (2006) found 51 applicable studies, yielding 99 effect sizes for almost 12,000 students. Like the Sitzman et al. (2006) study, they were able to

code an extensive number of factors describing the type of characteristics of courses. Again, in general agreement with field, on-line courses were slightly more effective than face-to-face courses, however, the difference in this study was not significant. Likewise, there was extensive and larger variance in effect sizes for both forms.

They found the following significant outcomes. First, studies published after 1998 were significantly more likely to report distance education being more effective. They also found that the kind of outcome measure used explained some of the differences; specifically, student self-assessments of learning tend to slightly favor face-to-face education; when other common metrics, including grades or student attitudes are measured, they significantly favor distance education. (That is, DE students think they are not learning as much when in fact they are). Like Sitzman et al., they also found that the combination of distance and face-to-face instruction (hybrid courses) seemed to be most effective. In general, they found three factors that favored distance education: instructor involvement, media involvement (hybrid), and the type of interaction used (both synchronous and asynchronous interaction was best). Unlike Sitzman et al., though, instructor involvement was a significant moderator; indeed, it was the most significant moderator of outcomes. "When instructor involvement is low, the outcome of distance education is not as positive as those of face-to-face education; when instructor involvement increases, distance education programs yield more positive outcomes than face-to-face education" (page 33).

Summary of the meta-analytic research

The meta-analytic reviews of distance education agree on two major points: first, distance education is as effective (if not slightly more so) than traditional classroom-based, face-

to-face instruction on many measures of academic performance; and second, there is a large

range of variance in both forms of educational delivery. Alternatively, there is substantial

opportunity to improve both online and classroom-based instruction; even further, there is a lack

of quality consistency in education, regardless of the delivery mechanisms used. Such a

conclusion supports the original position of Clark (1994) that technology was instructionally

neutral, or in other words, that it is pedagogical methods -- not technology systems -- that are

determinative in producing learning outcomes.

This research has also identified a number of factors that seem to differentiate courses in

terms of their effectiveness. There are some methodological artifacts, such as the date of the

study and type of outcome measure used, that produce some of the variance in results. This

research is also cognizant of multiple threats to study validity, such as differences in teacher skill

or lack of equivalency between course structures. There does seem to be some agreement that

individual preferences and abilities are important entry conditions; specifically, when students

can select the type of delivery mechanism they prefer, better learning results. In other words,

preexisting differences among learners are more than a threat to validity; they are important

exogenous variables to consider in assessing instructional effectiveness. A number of other

pedagogical and instructional practices have been identified as having some role. Often, the

instructional practices are not delivery-specific but rather refer to good pedagogical techniques

being used, regardless of the delivery method. In this context, consider the importance of

practice for learning skills or techniques: computer-based training modules may actually be a

superior way to provide practice; such a method can be used both in classrooms and through on

line delivery. This research also has noted several factors about which the results are equivocal,

such as the relative value of synchronous vs. asynchronous communications, the importance of

the instructor presence, and so on. Finally, there does seem to be agreement that hybrid or mixed

media courses may actually be the most effective.

Limitations to and criticisms of these comparative studies

Research comparing online vs. in-class educational courses has its critics and criticisms.

A general set of criticisms against such research has been offered by Lockee, Burton and Cross

(1999). For example, they note these persistent weaknesses in the basic research protocols: lack

of adequate theory, inadequate sample sizes, weak implementation of the online treatment

condition, and measurement flaws. Moreover, particularly for experimental comparative studies,

the standard is that all else is the same except for the one manipulated independent variable. To

the extent that all other possible differences have not been removed, questions of interpretation

remain. For example, if the instructor(s) used in such comparative studies has (have) different

degrees of experience teaching online vs. in-class, there can be subtle yet nonetheless noticeable

effects on the delivery of the course and the quality of the outcomes (Anstine and Skidmore,

2005). Since pedagogical practices seem to make a big difference in outcomes, this factor could

be an important confounding variable in comparative analyses.

Another critical issue involves the reliability and validity of the measurement instruments

being used; in this context, the instruments are usually learning achievement tests. These tests

are often made by the teachers but without assessments of reliability or validity. When testing

instruments of unknown psychometric quality are used for grading purposes (as is typically the

case in the studies), there is a potential instrumentation threat to validity. Critics devote special

attention to the use of the null hypothesis of no significant differences as a justifying conclusion

of the research. Such a finding does not prove that on-line education is as good as classroom

education. Indeed, accepting the null hypothesis does not refute the tested or alternative

hypothesis of differences.

There are two persistent threats to the validity of studies comparing DE v. f2f classes.

One has already been alluded to: the differential retention rates of online and f2f courses. The

threat is, of course, subject mortality. As reported by the Bernard and associates (2004) meta-

analysis, online courses have significantly higher drop-out rates than f2f classes. A reasonable

inference (one that would need verification, though) is that the students who drop out of an

online course are probably the ones who are doing poorly, not the ones who feel confident in

passing it successfully. Thus, the students left in the Online class at the time of the final

examination will likely be at an upwardly biased or skewed level of learning. In other words, it

reasonable expectation is that without the higher dropout levels, the average achievement scores

of students taking on-line courses could easily be lower. Whether this would be enough to

produce a significantly lower outcome is not known. One other check on this point would be to

look at studies where there are minimal if any differences in dropout rates between online and

face-to-face courses in order to determine if there are differences in achievement outcomes.

The other threat to validity comes from pre-existing differences. Often, it is simply

impossible in higher educational settings to randomly place students in on-line or face-to-face

courses. That is, students typically self-select the course format they will use. This self-

selection factor can function to produce effects or outcomes independent of whatever

instructional format is being used. As Lockee, Burton and Cross (1999) put it:

> participants in higher education courses are typically non-traditional learners who cannot
> attend class at the originating institution, hence their enrollment in distance programs.
> Not only are the students different demographically, but they also possess of the
> characteristics which vary from traditional college attendees, such as prior knowledge
> and experience and level of motivation. (p. 5).

This issue can be seen in a study by Shulman and Sims (1999). They studied

achievement outcomes of students in either face-to-face or online versions of the same courses.

Five different courses, representing several different disciplines, were used. The same

instructors taught each respective pair of courses, and students self-selected the course format.

Both pre- and post-test measures were collected. As would be expected, there were no

significant differences between the online and the face-to-face scores at the end of the semester.

However, there were significant differences in the pre-test scores; specifically, students enrolled

in the on-line courses scored significantly higher than did the students in the face-to-face version

(average online pretest scores was 40.70, while the average pretest scores for the in class

students was 27.64). In other words, more learning occurred in the in-class formats than in the

online versions. By using pretest measures, an entirely different understanding of the

effectiveness of online, distance education emerges. Indeed, one is left wanting a new

metaanalysis that compares change scores, using pre and post measures, between DE and face-

to-face courses. Such a focus might also change the nature of the question from: Is there any

difference in learning achievement scores between the two formats, to: Which format produces

more learning?

Distance Education: Guidelines and Standards

If online education can be as good as in-class education, what should be done to ensure

the highest consistent level of quality learning in on-line courses? As noted earlier, the very

wide distribution of effect sizes for both online as well as in-class programs indicates a strong

need for identifying and implementing policies and procedures that will narrow that gap and

produce consistently high educational and learning outcomes. Various attempts have been made

to address or establish guidelines for structuring online education. Several of those attempts will be noted below, followed by an integrative listing.

One approach to determining recommendations for effective online instruction can be through actual evaluations of courses, as can be seen in the evaluation of four on-line courses conducted by Gramm and his colleagues (2000). They used an evaluative framework based upon a model of good practices in undergraduate education (Chickering and Gamson, 1987). That is, according to this model, there are seven principles for effective instruction: student-faculty contact, encouraging cooperation among students, promoting active learning, prompt feedback, emphasizing time on task, communicating high expectations, and respecting diverse talents and ways learning. From this evaluation, a number of recommended practices were inferred. (Those recommendations will be integrated into the framework reviewed shortly.)

A second source of guidelines comes from prescriptive reports and assessments. For example, Hazari and Schnorr (1999), noting the widespread opportunities for interaction and feedback between students and their teachers in online programs, observed that such opportunities are seldom used. Rather, educators often use the Web simply to distribute static documents. Instead, feedback and assessment procedures can be implemented to monitor progress in learning as well as evaluate teaching approaches. They recommend using HTML Forms (a special editing program available in such products as Microsoft Frontpage or Adobe PageMemo) that can be used to create data collection and reporting forms. "HTML forms have designated fields in which the user enters information that is sent back to the course instructor via the web. In most cases, students fill out the feedback form and press the 'Submit' button to automatically forward student-entered data to faculty as an e-mail message" (page 31).

Procedures enable interaction and feedback, engaging students in both participating and reacting to comments.

A third source of practice guidelines can be found in standards-setting policies adopted by various accrediting agencies. The process of online education cannot be divorced from the accrediting issues that may be involved. "In 2001, the eight U.S. regional accrediting commissions, in an attempt to hold on-line programs to high standards, collectively created a best practices statement to assist institutions and facilitating on-line programs" (Grandzol and Grandzol, 2006, p 4). The resulting document (Best Practices, n.d.) used five separate components of distance education programs (see below) as a framework for making recommendations. Other attempts at doing the same have been offered by the accrediting agency of business schools, the Association to Advance Collegiate Schools of Business (AACSB) for standards for online education for business programs; and the American Association of Colleges of Nursing (AACN) for online nurse educational programs. These various recommendations have been consolidated below using the Best Practices, five-component model as the organizing framework. (When practices are drawn from the other sources, that source is indicated by one of these acronyms: CSB= AACSB; CN=AACN; TWB= Graham et al., Teaching in a web- based distance learning environment).

I. <u>Institutional context and commitment</u>. Online programs create a new and potentially very different extension of the historical role and functioning of the institution. A critical issue then is the extent to which this extension both fits with and is supported by the institution. Particulars:

- The Institution's budgets and policies should reflect the commitment to students who are learning on-line. CSB

- The institution insures adequate technical and physical facilities, including appropriate staffing and technical assistance, to support electronic on-line programming; this requires substantial financial investment in technology, infrastructure and faculty development. CSB, AACN.

- The internal organizational structure for operating the on-line programs maintains appropriate academic oversight that ensures the integrity of student work and faculty instruction. The institution ensures that DE learning outcomes are of comparable quality to on-campus programs. CSB

- The institution evaluates courses and programs on their learning outcomes, not in terms of their modes of delivery.

- Institutions should undertake distance education for reasons other than achieving a financial windfall. CSB

II. <u>Curriculum and instruction</u>. As already suggested in the research, pedagogical practices are particularly important in determining the quality of online education. Particulars:

- The institution assures that each program of study produces a level of learning appropriate to the rigor and depth of the degree or certificate being awarded.

- The focus of educational efforts should shift from the traditional concern for teaching to a broader emphasis on producing learning effectiveness. CSB

- Academically qualified professionals participate fully in the decisions about the program curriculum and program oversight. Include a variety of stakeholders in planning. CSB

- The institution provides a way for students to access all courses necessary to complete the program or will notify them of requirements not available electronically.

- Appropriate interaction between the instructor and students, and among students is reflected in the design of the program and its courses; appropriate technical facilities and support services enable the interaction. E-mail communication policies should be clearly communicated, such as hours for availability, response time, and so on; students who are falling behind or not regularly participating in online discussions should be contacted by the instructor. CSB, TWB

- Student interactions should be encouraged through both well-designed group projects as well as the well-designed discussions; students can participate in face-to-face meetings at the start of the semester to build a sense of community. The assignments should include meaningful interaction. Likewise, there should be a means to evaluate individual participation and contribution to group work [to counter social loafing]. TWB

- Students should present their work to the rest of the class, and class members should be encouraged to give feedback. TWB

- Students should be given a structure of regular work assignments and schedules for the entire semester the will provide a disciplined framework for staying with material. TWB

"Educators should design learning experiences to take advantage of various modalities that best fit with learning objectives and with student learning styles" (AACSB, 2007, page 10).

III. Faculty support. Particularly for faculty used to traditional instruction, online instruction involves new pedagogical approaches and new skills (CSB). Providing appropriate support by the institution is necessary. Particulars:

- The institution and faculty have addressed the issues of workload, compensation, ownership of intellectual property, and the implications of online teaching for the faculty member's professional evaluation. CSB [1]

- The institution provides ongoing technical, design, and production support for faculty.

- There is a climate that encourages and rewards innovation and risk-taking. AACN

- The institution provides appropriate training in technology, course design and management.

- Faculties should understand and support the change from a teaching-centered to a learning-centered environment. They should be both creative and willing to learn new teaching methods. AACN, CSB

- Faculty members should be encouraged to learn from each other in their experiences with online teaching. This can be done formally or informally. Awards for teaching innovations may be useful, too. TWB

According to Graham et al. (2000), " instructors are generally motivated to do an excellent job of teaching in an online environment but are not always up to date with what strategies will be most successful in the online teaching environment" (p. 19).

IV. <u>Student support</u>. Appropriate institutional practices provide appropriate support for students. Particulars:

- The institution has a commitment (administrative, financial, and technical) to continue a program for a period of time sufficient to enable all admitted students to complete the degree or certificate in the normal time frame.

- The full range of student support services should generally be the planned and made ready prior to the implementation of distance education programs. Prior to admitting students to a program, the institution informs prospective students about required technology and technical competence required. Students also are told of library and other learning services available. CSB

- The design of the program attempts to develop a sense of learning community through such activities as encouraging study groups, providing student directories, limitations to campus events, and similar activities.

V. <u>Evaluation and assessment</u>. Both the assessment of student achievement and the evaluation of the overall program take on added importance in online situations. This is especially an issue in asynchronous programs, when seat time or time on task cannot be adequately assessed or controlled. Particulars:

- There is documented assessment of student achievement in each course; at the completion of the program, student performance is compared to intended learning and outcomes.

- Testing situations are conducted in such a way as to assure the integrity of student work by validating student identity.

- There are documented procedures to assure the security of personal information in assessments.

- Program effectiveness should include measures of student achievement against intended learning outcomes, student retention rates, and satisfaction levels for both students and faculty.

- The institution conducts a program of continual self-evaluation of its on-line programs.

Tallent-Runnels and associates (2006) completed a more traditional literature review of online studies. They found 76 studies, both quantitative and qualitative in nature, from which they extracted a list of lessons about online learning. Lessons were organized in four major categories: course environment, learner outcomes, learner characteristics, and institutional and administrative factors. For purposes here, the lessons can be identified as either pros, cons, issues or cautions, and guidelines. This list is summarized in Appendix I. In general, they concluded that few definitive guidelines can be derived from the existing research. Nonetheless, some conclusions seem warranted. First, some students -- but not necessarily all -- prefer to move at their own pace and schedule through a course. This is likely to be an individual difference factor, though, reflecting such traits as personality, self-management or study habits, and other factors. Second, the quality of learning that occurs in an online environment is significantly affected by the quality of the instruction provided.

> Not surprisingly, students in well-designed and well-implemented on-line courses learn significantly more, and more effectively, than those in on-line courses where teaching and learning activities were not carefully planned and where the delivery and accessibility are impeded by technology problems. This finding challenges online instructors to design their courses in accordance with sound educational theories. (P.116).

Applications and Implications

Surprisingly, a number of recommendations that have emerged tend to focus on factors and conditions outside the immediate online instructional experience. In particular, the positioning of online courses within the broader institutional framework in terms of its suitability and support enjoyed widespread agreement. As important in this framework is the provision of

adequate technical and administrative support. Another important set of recommendations

involved instructor/faculty preparation. But this goes beyond simple faculty training to include

policies and decisions on compensation, workload, and P&T matters. Another point of emphasis

has been on adequate communications to (including promotional information) and preparation of

students. In a sense, all these factors refer to critical enabling conditions that increase the

chances of effective instructional design and delivery through online environment.

Another critical finding in this regard is the apparent neutrality of technology on

conventional measures of learning achievement. That is, using relatively standard testing

procedures, there seems to be little difference in overall effectiveness between classroom-based

and on-line courses. Instead, the immediately critical factor responsible for the variances and

quality of education is the pedagogical practices employed. To date, I have not seen an

assessment of online pedagogical practices that have compared top and bottom performing

classes in terms of pedagogical procedures used. Instead, it appears that the recommendations

for pedagogical practices are based more on the experience and informed conjecture. It seems

likely that well-established research-based guidelines for the best pedagogical practices are still

waiting.

That being said, certain types of pedagogical practices seem to enjoy relatively

widespread support. These conclude following: focused yet regular communications and

interactions between the instructor and students, as well as among students themselves. There

are some technical details about best methods for communicating information. Adams and

Morgan (2007) note that e-learning instruction has shown itself effective in teaching "technical"

but not "soft" skills.

> …this approach can be effective for delivering expert knowledge and technical training,
> especially when there are right or wrong answers which learners need to understand. It is

not as effective for education, training and development in soft-skills areas where the answers to predetermined questions depend on the detailed nature of the problems that have to be addressed…. (p. 165)

They argue that technical skills training (what they call "first generation" e-learning approaches) are instructor-controlled, predetermined linear learning programs where learning focuses on memorizing rules of practice, repetitive drill and frequent passing of embedded testing. A "second generation" approach that puts the learner in control of a discovery-based process using reflection and self-assessment for integrating knowledge would be more suitable for developing soft skills. A second-generation e-learning system is question-based and encourages the learner to explore material in ways that are unique and specific to the person. They report data on a program they developed implementing this approach (NewMindsets) that was effective. [2]

Unanswered Questions -- or Unknown Answers?

As a working paper, this document represents a first attempt to summarize the research literature regarding distance education and on-line learning. An important and apparently robust finding is that, in general, online education is as good as more traditional, campus-based courses. This conclusion exists in the larger context of extremely wide variation in the quality of both delivery approaches. Beyond that conclusion, though, finding more solid recommendations for policy and practice is difficult. In short, it appears that there are a number of important yet still unanswered questions. Its not clear, though, whether the research has not caught up to the questions, or whether I have simply not caught up to the research.

Regardless, it is useful to identify some of the critical issues that still need to be addressed, in my view, in order to round out our understanding of the practice of online education and learning. Those questions are presented below in no particular order.

1. In the meta-analysis by Bernard and his associates (2004), differences were noted between synchronous and asynchronous courses. Why would there be such differences based upon the timing of dialogue and communication circumstances?

2. Computer assisted instructional modules have a stronger effect than distance education in general. Clearly, computer assisted instructional modules can be delivered as effectively online as in a campus-based computer lab. How can CAI modules be best included in distance educational courses?

3. What are the best pedagogical practices for online learning? In turn, what do those practices mean for the role of the teacher, and what kind of skills must an online teacher possess? Further, how does the job performance characteristics of online teaching profile against traditional education? For example, the traditional time spent lecturing in a classroom would typically no longer apply; so how do online teachers use their time?

4. In general, what is the range and variety of on-line help pedagogical practices? For example, experiential learning techniques (see Silberman, 2007) offer a number of methods for engaging students in activities as the foundation for learning. To what extent can those practices be modified or adapted to online instruction? What kinds of experiential methods would not be adaptable? And are there unique pedagogical techniques for online learning?

5. How important are individual difference factors in explaining or supporting learning achievement and on-line programs? Some research supports the effect of individual differences. What differences are important, and what are the implications of individual differences for online instruction? When should those differences be assessed, with what instruments, and how should that information be used?

6. In terms of specialized applications, one could argue that graduate-level education can be

distinguished from undergraduate education not only in terms of its depth but also in its focus.

Specifically, graduate education often is oriented towards professional practice, whether it be in

medicine, technology, business, psychology, nursing, or other fields. The issue is what is the

proper structure for educating for professional practice? At least four different areas of emphasis

can be identified in this regard. First, there needs to be knowledge of basic structure and

process. Medical doctors need to learn both anatomy and physiology. Second, there needs to be

drill and practice in techniques. Business students must learn how to conduct financial analysis

or how to do a marketing plan, skills presumably improved through multiple practice

assignments. Third, there is the need for diagnostic talents, which involve actual data collection

in field conditions. Engineers must learn how to evaluate sub-surface soil and rock conditions in

putting up a building, for example. These diagnostic procedures may often involve applying the

techniques already learned but in the context of actual operating conditions. Finally, practicing

professionals must learn to be able to operate using the principles of evidence-based practice.

Did the patient recover? Did organizational revenue increase? Did the building stand as planned?

In this framework, the design of the educational curriculum should be based on the educational

methods and techniques which will best produce the learning outcomes needed. In other words,

pedagogy should trump delivery. To what extent can online education appropriately and

effectively implement each of the purported stages of professional education?

Online learning has become the growth product in the educational realm. Given all its

apparent attractiveness, particularly the convenience it offers to students and its potential

revenue enhancing capabilities at minimal investment cost, on-line learning acts as a powerful

magnet in curricular design. The evidence for online education is not dismissive but is rather

supportive. Yet the potential for weakening educational quality through online learning seems as

great as its potential for improving it. In order to move forward, more secure footing is needed;

identifying how to make distance education as consistently effective as possible is no doubt the

essential next step.

Endnotes

1. Milheim (2001) argues that institutions need to make policy decisions about the following

compensation issues: Do you pay for course development and/or delivery of the course? How

should compensation be restructured: in regular salary compensation, as a percentage of

royalties, or as course release time? In addition, he notes that teaching a distance education

course is potentially risky to faculty in several ways. First, the heightened workload can

compromise or reduce time devoted to scholarship and thereby threaten promotion and tenure

opportunities; further, since students in online courses tend to rate faculty teaching lower, that

can impact current merit review and reward outcomes. Such issues are particularly problematic

for new faculty members. (The increase in teaching time and commitment comes from several

sources in on-line programs: increased preparation time for various instructional materials;

higher needs for interaction with students online; and potential travel time and/or meetings with

students at remote sites.)

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Appendix I. Lessons from the Literature. Derived from Tallent-Runnels, et al. (2006) and Grandzol and Grandzol (2006).

Table 1. Course Environment that includes: 1) Classroom culture
                                           2) Structural Assistance
                                           3) Success factors
                                           4) Interaction systems
                                           5) Evaluation system

Pros/Advantages	Cons/Disadvantages	Issues and Cautions	Guidelines
1) CLASSROOM CULTURE. In asynchronous formats, students have more time to think about their responses which should improve depth of processing, Anonymity can be an advantage	OL courses do not embody "conversational language" OL formats tolerate unchallenged ideas	Instructors may ignore student affective states in online discussions which can be harmful	Establish a community of learners by setting up study groups, modeling effective communications, or having initial and/or periodic f-2-f meetings. Learner-focused designs are critical
2) STRUCTURAL ASSISTANCE. The self-pacing nature of OL learning is appreciated by students.		[Students need real-time interactions with instructors; in OL, this is probably 1-1 but extends demands on instructor's time. Observation: OL is convenient to students but increases instructor's workload. Question: whose time is more important?]	Motion/video presentations enhance online instruction above simply providing slides The pedagogically most important information should be presented via video Instructors should provide "instructional scaffolds" [advance organizers?] as guiding questions help students progress thru the

			material
		OL courses require higher degrees of student self-management and direction	Students need time interacting with instructors to help them learn material better. Students value email communications with the instructor.
3) SUCCESS FACTORS	Some number of students (41%) do not like learning from the WWW. Some number prefer listening rather than reading.	Eight factors affect student success: access to tools, experience with technology, learning preferences, study habits, goals, purposes, lifestyles, and personal traits. Students spend more time on course material and work in classroom rather than OL formats	Instrument for assessing student learning preferences: Online Learning Environments Survey One cannot simply duplicate an in-class design onto an online format One must design online courses to meet learner expectations and cognitive styles Students value and appreciate discussion.
4) INTERACTION SYSTEMS. The actual ratio of time-on-learning task / total classroom time should be higher in OL formats [but this comes from studies of pre-higher education schooling; that finding may not hold for higher education]	The availability of other media, both online, radio/TV, entertainment systems and so on present the opportunity for distractions while OL sessions are in progress [how do you know if student's are actually on-task and paying attention?]	One study found that students in OL settings process information at relatively low and superficial levels while rarely being engaged in knowledge negotiation, refinement and construction. [1]	Guidance or structures for participation should be geared at the deeper levels of processing. Instructors should provide prompt feedback and encourage social interaction and collaborative learning Synchronous discussions are better for social interaction; asynchronous

			discussions, for task processing. The instructor should avoid trying to respond to every student comment. Delegate duties in discussions: give various students duties to manage and/or summarize discussions. Ask other students to answer questions.
Online discussions allow everyone to participate (no competition for airtime)			
5) EVALUATION: no specific lessons			

1. "Students learn only when their current view of knowledge is challenged, reformed, and synthesized through their interaction with others." P. 100.

Table 2. Learner Outcomes: 1) cognitive and 2) affective.

Pros/Advantages	Cons/Disadvantages	Issues and Cautions	Guidelines
1)	Students separated from instructors may have a greater opportunity/incentive to turn in purely plagiarized work than when an instructor is present		Instructional material that is organized in a very structured, linear fashion is better for students that are low self-regulators An aptitude-interaction model will allow better integration of personality and instructional factors
2) Online learners most value the ability to set their own pace and scheduling. In-class students most valued			

interactions with the instructor and other students.			

Table 3. <u>Learner Characteristics</u>

Pros/Advantages	Cons/Disadvantages	Issues and Cautions	Guidelines
			For any kind of course, its important to recognize the student's goals, needs and motives

Table 4. <u>Institutional and Administrative Aspects:</u>

1) Institutional policies
2) Institutional support

Pros/Advantages	Cons/Disadvantages	Issues and Cautions	Guidelines
1)			There should be institutional policies for OL education
2)		Faculty believe they should be paid for developing the course. They believe that OL courses take more time	OL instructors want training that is used on demand, has follow-thru and support resources. They wanted the Dept chair to be visible. This should include support and assistance for both course development and delivery