



# A distance learning approach to teaching management science and statistics

John Lawrence

*California State University, Fullerton, California, USA*

Received 28 September 2002; accepted 17 December 2002

---

## Abstract

Although there is no universal approach for offering distance learning courses over the Internet, nonetheless distance learning has emerged as a formidable way to offer instruction for many types of courses. One approach that has been successfully used for teaching introductory statistics and management science/operations research courses in a College of Business is discussed.

*Keywords:* Distance learning, management science, statistics, teaching

---

## 1. Introduction

Distance learning has become a popular delivery mode for all types of university courses. Quantitative courses are no exception. There is worldwide interest in such courses, as evidenced by the scheduling of and attendance at distance learning tutorials and sessions at major quantitative conferences such as IFORS and INFORMS. Questions raised at these sessions include, 'Is distance learning today's fad – will it rapidly fade away?', 'Who retains control of on-line courses developed by university faculty?', 'Aren't the startup costs high?', 'Once developed, what about maintenance costs?', 'Will quality suffer from using a distance learning approach?', and more basically, 'How do I prepare and deliver a quantitative course on-line?' These and others are appropriate questions that should be considered by prospective on-line instructors.

Wilson (1998) reports that by far the number one concern of a faculty contemplating the teaching of distance learning classes is the question of the time commitment to develop and maintain course material. The National Education Association reports that in spite of spending more hours on distance learning classes than on traditional classes, 84% of a distance learning faculty receive no course reduction and 63% get compensated for distance learning questions as if they were part of their normal teaching load. Student/staff/faculty support are also issues for a distance learning faculty.

Here, these questions are addressed from the perspective of an instructor of on-line courses in introductory statistics and management science given in the College of Business Administration and Economics at California State University, Fullerton. Approximately 20 sections of each of these two introductory courses are offered each semester, with only one section of each being designated as an on-line class. The class size of each section is approximately 45. There are no graduate assistants or other support personnel to assist in grading or web design. There is some limited technical support in terms of answering specific software questions that can arise and there are 'short courses' offered by the Faculty Development Center on presentation software and related topics, but there is not the luxury of having a specific person assigned to the faculty member to assist in the development of a web-based class.

The College sometimes (not always) provides a one-time one course reduction in the workload of four courses per semester or a small monetary compensation for a first-time development of an on-line course (defined as one in which at least 30% of the material is delivered on-line), but there is no ongoing support after the first-time offering. Since teaching on-line classes is completely voluntary, those that choose to do so are typically motivated simply by a sense of responsibility of offering alternative delivery modes for the students.

## **2. Distance learning – a trend or a passing fancy?**

One consideration faced by many faculty is the question of whether distance learning will have the staying power to warrant diverting time and effort away from traditional research and proven teaching approaches of quantitative subjects. This is a legitimate concern since some university entities which had high hopes for 'for-profit' distance education (e.g. Virtual Temple at Temple University) have already cut back or abandoned such efforts. But despite these setbacks, the number of distance education courses offered nationwide has, in fact, continued to grow exponentially.

By 1998, the National Center for Education Statistics found that over 44% of all higher education institutions offered distance learning courses, which was over a one-third increase from just three years earlier. At that point they found that there were over 1.3 million total enrollments in over 50,000 distance learning course offerings. In June 2000, the National Education Association reported that over 90% of its members were at institutions that were offering or considering offering distance learning courses and that over 10% of its members had already taught at least one course on-line. In June 2001, the National Governors Association, while citing the need to oversee quality, nonetheless enthusiastically endorsed expanded distance learning opportunities.

There are numerous reasons for this phenomenon. Advances in hardware technology, advances in the capabilities of software programs, advances in presentation software, an increasing 'non-traditional' university population, the review capabilities of on-line courses, course costs, and, of course, convenience are just some of the factors that have all come together at the same time to make distance learning particularly attractive.

Since there is no evidence that any of these factors will reverse course and there does not seem to be other alternatives in the immediate future, it is reasonable to conclude that there is nothing

to alter the direction of the acceptance of distance learning courses. Thus any concerns that distance learning is a fad should be minimized.

### **3. What is a distance learning e-course?**

When discussing distance learning and e-courses, just what is being referred to? Definitions abound. One commonly accepted definition offered by Phipps, Wellman and Merisotis (1998) is that distance learning is instruction that is ‘delivered to one or more individuals located in one or more venues’. Phillips (2002) states that distance learning occurs when the instructor and student are ‘geographically remote’ from one another and may occur ‘by surface mail, video, interactive or cable TV, satellite broadcast, or any number of internet technologies such as message boards, chat rooms, and desktop video or computer conferencing’. Distance learning is still in its infancy and as the last reference suggests, there are numerous ways to deliver a distance learning course.

E-courses include a technological (electronic) component. The delivery format can be synchronous, where instructor/student communication occurs at the same time (e.g. from two-way video feeds) or asynchronous, where this is not the case. They may or may not have components that are not electronic. For example, while homework may be assigned and submitted on-line, exams may be given in the classroom on certain dates or administered at remote locations by designated proctors who in turn e-mail or surface mail completed exams to the instructor.

E-courses can include or use, among other things, any or all of the following:

- the Internet;
- two-way real-time video;
- videotapes;
- CD’s;
- narrated presentations;
- non-narrated notes;
- ASCII files;
- presentation software (e.g. Blackboard, Web-CT, etc.);
- links to supporting material.

Here are a few examples of on-line courses.

- MIT offers both satellite broadcasting of courses and asynchronous modes of delivery.
- One statistics course at Penn State is an asynchronous course with homework, activities, projects, and midterms submitted on-line, while the final exam is proctored and mailed back to the instructor.
- At the University of Washington, one of the statistics courses is offered with 100% of the text-based material presented in an asynchronous mode with no video or audio components; students have the option of submitting homework either by surface mail or by e-mail, but exams are offered, proctored at remote locations and students can move at their own pace with only a 180-day time limit.
- A statistics course at Texas A&M University evolved from a two-way video course; when the signal proved to be a problem, it was changed to a course using Microsoft streaming media and

certain features from Web-CT, but again the final exam is proctored and sent back to the instructor.

- At Purdue some courses are by two-way video (or one-way delayed video), others are delivered in an asynchronous mode; virtual teams are set up for projects with team members never meeting each other face to face.

The list is limitless.

#### **4. Development of an e-course in introductory statistics and management science**

The courses described in this section were developed by one professor for the Department of Information Systems and Decision Sciences in the College of Business and Economics at California State University, Fullerton. In this section the courses are described, the technical tools needed for the course development listed, and the actual structure of the e-course is presented and discussed.

##### *Course descriptions*

The statistics class covers descriptive statistics, probability, inference, hypothesis testing of means, regression, and chi-squared contingency tables. The grade is based on the results of three midterm exams, a final, and an individual project that consists of downloading real data from an Internet site of their choosing and analyzing it. Homework is assigned, but not graded. Answers are posted on the website and are in hard copy form in the university library.

The management science course covers two population tests, ANOVA, forecasting, linear programming, project scheduling, decision analysis, inventory models, queuing models, and simulation. The grade in this class is based on three non-cumulative exams and a group (2–4 students) project. The project is a case (or a modified case) from the text used with the course in which they are asked to model and analyze a business situation using spreadsheets, and prepare a comprehensive business report. Again, homework is assigned and not graded with answers posted on the website and available in the library.

##### *Course philosophy*

Although this is a course in a business school, the theoretical background upon which the topics are based is not sacrificed. However, all exams are open-book, open note, and taken on the computer so that there is little reliance on memorization of formulas. Exams are designed mostly to mimic business situations, typically with simulated data supplied in spreadsheets. Questions related to assumptions and theory are interspersed throughout the exams. Since nowhere in real life will one be required to make recommendations or decisions by bubbling in circles, there are no multiple choice questions! Students perform work (in Excel) on the computer, store their answers to a floppy disk, write the answers on the test, and submit both the test and the floppy disk for grading.

*Technical skills required for developing the e-courses*

The e-courses have evolved over time, but began with only a working knowledge of:

- Microsoft Office (Word, Excel, and PowerPoint)
- Microsoft FrontPage

The forerunner to the on-line e-courses was simply a course given in the traditional lecture format but supplemented with PowerPoint slides first as handouts, then as files on the college's file server, and finally as a link on the instructor's website. Starting out with PowerPoint is a typical way that instructors get started with on-line courses. The PowerPoint slides need not be very advanced initially, but with experience comes the ability to add appropriate animation, timing, and a level of detail to the extent of coming close to replicating traditional lectures. The major PowerPoint features used are:

- creating the right kind of slide;
- editing of the Slide Master;
- use of Microsoft Equation;
- use of the Drawing toolbar including ordering and grouping;
- use of the cropping tool;
- importing Excel screenshots using PrintScreen and Alt+PrintScreen;
- adding animation and timing.

Word is used to create explanatory documents including descriptions on how to perform each management science and statistical procedure including graphing in Excel. Again only basic Word functions are needed together with the ability to:

- import Excel screen shots;
- use the Drawing toolbar.

Solving problems using Excel is a major emphasis on the website. Excel skills required include the use of:

- Relative and Absolute Address;
- Chart Wizard;
- mathematical functions such as IF, SUMIF, SUMPRODUCT, VLOOKUP, etc.;
- basic statistical functions such as NORMDIST, NORMINV, BINOMDIST, CHITEST, TDIST, TINV, etc.;
- data analysis;
- Solver.

The program perhaps least familiar to many is FrontPage, which is used to create, edit and maintain the website. Other platforms such as Blackboard and Web-CT serve the same purpose. FrontPage is a very powerful program with many exciting features. With minimal training of only an hour or so it is easy to learn the following basic FrontPage functions and procedures which are all that are used in this website:

- creating pages in HTML – done automatically by File – New – Page;
- importing files done by File – Import;

- inserting hyperlinks to files using INSERT – Hyperlink or CTRL+K;
- using the Folder and Page views to locate and manage files and folders;
- using the Navigation view to go between links within the website – done by typing CTRL+Click.

That is about all that was needed to get started. As time progressed new features were added including narration of the PowerPoint slides using a program called RealPresenter and the ability to narrate continuous motion using a program called Tegrity. RealPresenter requires the user to have RealPlayer (RealPlayer8 or above – at the time of writing the current version is RealOne). On the website a link to a download of a free version of the basic RealPlayer is provided.

Links to the audio files of the PowerPoint slides are also included on the website. However, it was found that buffering problems definitely occurred with 28.8K and even 56K modems and sometimes DSL modems did not work well. Consequently the audio files were downloaded to a CD which is distributed to students taking the on-line class.

Tegrity requires the installation of software to read Tegrity files on the user's computer. This software is installed in about a minute the first time a link requiring Tegrity on the website is clicked.

After installing the RealPresenter and Tegrity software, whether a link is to a PowerPoint file, Excel file, Word file, RealPresenter file, or a Tegrity file, is virtually transparent to the user. What he or she will do is simply click on a link and navigate through the system regardless of what format it is in. The fact that there is a variety of software products used within the website is, for the most part, irrelevant.

This allows the website to continuously evolve and be upgraded without having to tear down structures that have accumulated over time. Links and files can simply be removed and modified. This encourages experimentation with all sorts of new products. If it works, fine; if not, the link will be deleted and something else can be tried. It was mentioned that on this website, the audio files did not transmit well to 28.8K and 56K modems, so a CD was created with the appropriate files. In the future, these audio links may be replaced by another system. MSProducer, for example, is one product that will be experimented with, and, if successful included on the website. ALEKS, which contains a computerized statistics assessment system, is another product currently under review for future inclusion on the website.

### *Time commitments for the e-courses and communication*

The on-line courses are designed to replicate as closely as possible the courses given in the traditional mode. Recall that the on-line version of each course is just one section of approximately 20 sections of the course. It is offered as an alternative, but to a population that is still local to the university. Thus on-line students do and will also come to campus. They are required to attend class only for the first class meeting at the beginning of the semester (so that the course procedures and website can be explained and the CD distributed) and on exam days.

In addition, within a week prior to each exam, both an in-class review session and an on-line chat session are held. Both are optional. Experience has shown that over 50% attend the review session, but participation in the chat sessions (which are actually run through a link through Web-

CT) is minimal. There is documentation that this percentage has been experienced by other instructors that offer optional chat sessions.

The ability to communicate with the instructor throughout the course is crucial. Although there are many on-campus office hours and students may contact the professor at the office by phone and leave voice mails and faxes, the primary communication is done through e-mail.

By far the largest time commitment was the initial preparation of the course. After deciding to communicate primarily by print and narrated PowerPoint slides, the first task becomes the actual development of the slides. Although the introductory statistics and management science courses are well-suited for this format, it was shocking to find that what one initially thought could be explained in just two or three slides sometimes actually took 15 or 20 with large time commitments to preparing appropriate graphical illustrations and Excel files to demonstrate the respective points. Adding informational ‘balloons’ and other graphics with proper animation was frequently quite time-consuming.

The second and subsequent times the courses were taught in distance learning formats required less time than the first. However, updating, maintaining, and appending the website still required a significant time commitment at least equivalent to that of traditional courses.

One must also be cognizant about the frequency of e-mails. In classes of size 45, one can expect an average of at least 2-3 e-mails per day. Closer to exam time, this number could increase more than five-fold. Students are told to put the course number in the subject line of the e-mails and they will be answered first, usually in less than 24 hours, frequently within an hour. Most take very little time to respond to, but a few can take several minutes to prepare appropriate responses.

The bottom line – distance learning courses require a lot of care, a lot of work, and a significant time commitment.

### *Structure of the course and website*

The on-line courses use standard text books which include their own PowerPoint slides and other learning aids. The primary goal for the website is to offer instruction similar to that of a traditional course yet taking advantage of the opportunities afforded by an on-line approach. The home page for each course on the website has the components shown in Fig. 1.

### *The syllabus*

The syllabus gives the course outline, grading policy and requirements, and a lecture-by-lecture calendar of topic coverage, corresponding text reading, and the appropriate PowerPoint modules covering the subject material. The current version is written in Word, but future versions will be in HTML with links to the appropriate PowerPoint modules.

### *Instructor Bulletin Board*

This is a one-way communication of topics from the instructor to the student. Important messages about downloads, tests, recurring problems encountered by students, etc. are posted here.

# ***ISDS 361A***

---

Syllabus

Instructor Bulletin Board   Chat

**PowerPoint/Exercises**

**Excel Answers to Selected HW**

Class Project

Excel Notes   Excel Files

**ON-LINE TUTORING THROUGH CSUF LEARNING CENTER**

Fig. 1. Home page for the Introductory Statistics Course.

Students are asked to check this link periodically (once a week or so) for updates. It is simply a table of two columns giving the date of the message in the first column and the message in the second. At present there is no two-way posting for student to professor and vice versa and there does not seem to be much need to develop one. However, in the future, when it is anticipated that the platform for this website will be switched to Blackboard, such a two-way bulletin board will be a standard feature.

## *Chat*

The Chat link goes through a Web-CT server. Students can utilize Chat at any time. However, chat sessions with the instructor are regularly scheduled during the week prior to the exam and at other times the instructor feels are necessary. The instructor will let the students know about the extra chat sessions via messages on the Instructor Bulletin Board.

## *PowerPoint/Exercises*

This link contains the meat of the website. As shown in Fig. 2, this link generates a table divided into modules. Each module corresponds to a major grouping of topics in the course and corresponds to the material covered on a midterm exam. Each major module, in turn, is divided into smaller submodules covering a specific topic.

The table is divided into four columns. The first column lists the topic covered in the submodule.

The second column gives links to the PowerPoint presentations covering the submodule topic. Clicking on PRINT will bring up the standard PowerPoint presentation complete with animations. The student is encouraged to download and print each submodule three slides to a



# MODULE A

## Descriptive Statistics and Probability

Module	PowerPoint	Homework Exercises	Excel Files
A1 Intro	<a href="#">Print Audio(11)</a>	1.4, 1.6, 1.7, 1.8	
A2 Quant Graphs	<a href="#">Print Audio(30)</a>	Do all by Excel and by hand: 2.11a,b,e 2.12b--also construct a relative frequency histogram 2.13, 2.17(no stem and leaf) 2.18, 2.20	<a href="#">Incomes</a>
A3 Qual Graphs	<a href="#">Print Audio(22)</a>	Do all by Excel and by hand: 2.30 (also do a bar chart), 2.32, 2.40, 2.41, 2.44	<a href="#">Color Epencil Ad Dollars</a>
A4 Central	<a href="#">Print Audio(16)</a>	4.5, 4.7, 4.8, 4.9, 4.13	
A5 Variance	<a href="#">Print Audio(26)</a>	4.18, 4.22, 4.31, 4.36, 4.41, 4.48, 4.46	

Fig. 2. The PowerPoint/Exercises Link.

page. When three slides to a page are printed, PowerPoint puts lines immediately to the right of each slide so that the student can add his own notes. After downloading the PRINT version, clicking on AUDIO will give the audio version of the same PowerPoint slides. The number next to the word 'AUDIO' gives the time in minutes of the audio presentation. Because of buffering problems with slower modems, these audio files are also given to the student on a CD. Listening to the audio version with the printed PowerPoint slides is intended to simulate a 'real lecture' with lecture notes. However, by having an audio version, the student has the ability to replay over and over again pieces of the 'lecture' that might not be initially absorbed. Although the student will not have immediate one-to-one interaction with the professor and there will be no professor there to tell 'war stories' or engage students in interaction, these audio slides with the enhancements of color and animation that can be absent in an in-class presentation, actually make for an effective, though different, learning experience.

The third column gives the homework assignments from the text for each submodule. A link to the answers is the next link on the course home page.

Excel approaches are discussed in many of the PowerPoint presentations. Links to the actual Excel spreadsheets depicted in screenshots are given in the fourth column. By clicking on a spreadsheet link, the student can duplicate the procedures outlined in the PowerPoint presentation or can click on individual cells to see the actual formula.

As shown in Fig. 3, at the bottom of each module is a sample exam and corresponding Excel files. Links are provided to both unanswered and answered versions of exams and their Excel spreadsheets. Students are encouraged to attempt the unanswered version first and then compare their results with the answered version.

B6 p-values	<a href="#">Print Audio(21)</a>	Do all by Excel (and by hand where appropriate): Use the p-value approach to solve the problems for Module B5; also add 10.59, 10.60, 10.61	<a href="#">Hyp Test</a> <a href="#">Sigma</a> <a href="#">Known p</a> <a href="#">values Ta</a>
B7 Type II Errors	<a href="#">Print Audio(27)</a>	10.48, 10.49, 10.50, 10.55	<a href="#">Calculatir</a> <a href="#">Beta</a>
B8 t-Tests and Intervals	<a href="#">Print Audio(29)</a>	Do by hand 11.1-11.9, 11.26 Do by Excel 11.26(again), 11.28,11.29, 11.30, 11.31, 11.32, 11.33, 11.34	<a href="#">t tests ar</a> <a href="#">CI</a>
B9 Module B Review	<a href="#">Print Audio(6)</a>	Do all by hand and by Excel where appropriate: 5.8, 5.15, 8.13, 8.14, 9.20, 9.37, 9.38, 9.40, 9.43, 10.10, 10.11, 10.12, 10.35, 10.57, 10.58, 10.62, 10.63,11.9-11.16, 11.27, 11.72, 11.74, 11.80, 11.87	
<a href="#">Sample Exam#2</a>		<a href="#">Excel Files for Exam #2</a>	
<a href="#">Answered Sample Exam#2</a>		<a href="#">Excel Answers for Exam #2</a>	

Fig. 3. Links to Sample Exams.

### *Excel Answers to Selected Homework Problems*

Answer books typically show only final answers, hand calculations or at best, a final Excel screen. This link gives the completed Excel worksheets for selected problems and notations of how and why the spreadsheet was generated.

### *Excel Notes*

This is a valuable section which supplies links to files that give step-by-step instructions for performing statistical and management functions and tests. As shown in Fig. 4, specific functions and tests are listed under general categories.

Most of the files are Word files that include many Excel screenshots, although some are PowerPoint files, while others are Excel files. No matter what the format, they contain bubbles or text giving instructions and/or formulas. Still other files in this section are Tegrity files. Besides the narration of PowerPoint slides, Tegrity allows for an actual demonstration of the corresponding Excel procedure as if it were a video.

### *Excel Files*

In the fourth column of the PowerPoint/Exercises screen links were provided to Excel files for the corresponding submodule. The Excel Files link is a table of all the Excel files used on the website with a reference made to the corresponding submodule. The names in this list provide another way to click and generate the corresponding Excel file.

<b>EXCEL NOTES</b>	
<b>Graphing</b>	<u>Histograms and Rel. Freq. Histograms</u> <u>Ogives</u> <u>Pie Charts</u> <u>Bar Charts</u> <u>Line Charts</u> <u>Scatter Diagrams</u>
<b>Random Variables</b>	<u>Mean and Variance of Discrete RV's</u>
<b>Probability</b>	<u>Binomial</u> <u>Poisson</u> <u>Normal</u> <u>Exponential</u>

Fig. 4. Topics having step-by-step Excel instructions.

#### *ON-LINE TUTORING THROUGH CSUF LEARNING CENTER*

This link connects the student with a campus student learning center that provides assistance with many College of Business courses including the introductory statistics and management science courses.

#### **5. The success of the introductory statistics and management science e-courses**

At the time of writing, the introductory statistics e-course has been in place for three years, the management science course for only one. After a few more years there may be enough data to perform a valid statistical analysis of the results. For now, only a qualitative response is possible.

The level of success depends on the definition of success.

Are the courses successful in terms of quality? No matter how much effort is put into the development of a distance learning course, the classroom experience cannot be duplicated. But this should not be the measure. In the last section some of the benefits and drawbacks of the on-line course were given. Based on the objective of delivering an 'equivalent' course with the same topic coverage, the same projects, the same homework, and the same exams as the course given in the traditional mode, from a qualitative point of view the courses have been a resounding success. The courses appear popular as there are waiting lists each semester for the course.

Do the students perform equally well on the same exams? The instructor giving the course on-line usually has another section of the same course in the same semester given in the traditional mode so there is a basis for comparison. The short answer is that students taking the course in the traditional mode tend to perform better than those taking the course on-line. At first the

difference was rather substantial – an average of about a 10-point difference per exam. But lately this gap has narrowed considerably to the point that now the on-line class sometimes performs better than the traditional class.

There could be many reasons for this swing. First, on-line courses are only identified in the class schedule by a tiny footnote next to the course code, a footnote many students fail to read. Thus many students have enrolled in on-line courses without realizing they were on-line. As more and more courses are being offered in an on-line format, students are now paying more attention to the footnotes identifying such courses. The first time the statistics e-course was given, almost 70% did not realize they had enrolled in an on-line course, whereas in the most recent class this number has dropped to below 10%.

Second, the on-line student must be disciplined enough to budget his time and he must not be overwhelmed by the wealth of material available to him for each exam. After all, prior to each exam each on-line student has access to:

- text reading;
- PowerPoint slides that accompany the text;
- PowerPoint slides on the website;
- narrated PowerPoint slides;
- extra notes provided by the instructor via the Instructor Bulletin Board;
- homework assignments with answers and Excel files on the website;
- practice sample exam and Excel files;
- answered practice exam and Excel files;
- Excel Notes on the website for performing statistical/management science operations using Excel;
- optional review sessions;
- optional chat sessions;
- regular office hours;
- responses to e-mails, faxes and voicemails;
- both on-campus and on-line tutoring.

For many, this lengthy list might resemble information overload.

Third, the website has evolved over time, incorporating more and more features with better explanations. Problems with the audio over the web have been overcome by the introduction of a CD with the audio files. In short, the course presentation has improved since the initial offering.

Fourth, the students now have more experience with on-line courses as an increasing number of course offerings across many disciplines are now being offered in an on-line format. On-line courses are no longer the novelty they were just a few years ago.

## **6. Should you offer an e-course?**

This is a very personal question and many factors should be considered. You no doubt will have the quantitative skills and probably will have or can easily be trained to have the necessary computer skills. The question really becomes one of time and motivation, both monetary and otherwise. E-courses are labor intensive, particularly initially.

You should consider:

- course objectives;
- class sizes;
- time required to learn supporting software;
- time required to produce PowerPoint slides or other forms of communication of material (always much longer than you think);
- time to answer e-mails;
- time for other forms of communication – chat sessions, review sessions, etc.;
- number of other preparations;
- time needed for other professional obligations such as research and committee work;
- graduate assistant availability;
- staff support;
- intellectual property rights/copyright issues;
- maturity of students;
- the kind of exams/projects you wish to give;
- the available hardware/software for taking exams;
- compensation.

You should also consider your overall attitude towards distance learning. Do not undertake a project of this scope unless you are convinced in the viability of the medium and that you can make a positive contribution to it.

## References

- Phillips, V., 'The Virtual University Gazette's FAQ on Distance Learning, Accreditation, and College Degrees'. *Virtual University Gazette*, 1996–2002.
- Phipps, R., Wellman, J., Merisotis, J., 1998. Assuring Quality in Distance Learning: A Preliminary Review. A report prepared for the Council of Higher Education Accreditation, Institute for Higher Education Policy.
- Wilson, C., 1998. 'Concerns of Instructors Delivering Distance Learning via the WWW'. *On-Line Journal of Distance Learning Administration*, 1(3) Fall.