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DEVELOPING STRATEGIES TO EVALUATE THE EFFECTIVE USE OF ELECTRONIC PRESENTATION SOFTWARE IN COMMUNICATION EDUCATION

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DEVELOPING STRATEGIES TO EVALUATE THE EFFECTIVE USE OF ELECTRONIC PRESENTATION SOFTWARE IN COMMUNICATION EDUCATION

by

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Dedication

This dissertation would not have come to pass without Mark Knapp's unwavering support, true friendship, and horrible PowerPoint slides. With the fullest measure of devotion I am pleased to be able to dedicate this work to him.

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DEVELOPING STRATEGIES TO EVALUATE THE EFFECTIVE USE OF ELECTRONIC PRESENTATION SOFTWARE IN COMMUNICATION EDUCATION

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This dissertation seeks to investigate the efficacy of "slideware" programs like Microsoft PowerPoint in two areas of interest to educators and public speakers: a) the impact of slides on short term and long term learning, and b) whether slide design characteristics influence audience members' perceived satisfaction with a speaker's presentation. The experiment described here considered just two design characteristics—font style (serif vs. sans serif) and color contrast level (high or medium). Audiences viewed a live speech and were shown one of four combinations of the fonts Verdana or Times New Roman and color schemes of black text on an almond-colored background or white text on a medium blue background. A fifth group viewed the speech without the aid of accompanying slides. Statistical analysis of the results found that the speaker-only group (no slides) performed significantly poorer on tests of both short term and long term learning than the groups whose speaker used slides. Among the four groups whose

speaker used one of the slide design combinations there were no significant differences in either short term or long term learning. In terms of the effect of slide design on audience satisfaction, of three different satisfaction questions, significance only obtained in the results of one—audiences expressed a marked dislike of the medium contrast color combination of white text on a medium blue background. Because I had expected to find that short term and long term learning as well as general satisfaction would be greatest with the Verdana (sans serif) / black text on almond (high contrast) slide combination, the results left most of the proposed hypotheses unsupported, raising more questions than they answered. Prior to the analysis and discussion of these results, the first several chapters trace the historical development of visual aids within (and prior to the rise of) the Communication Studies discipline and offer a rationale for doing research into the pedagogical effects of slides.

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Introduction and Rationale

"Occasionally designers seem to seek credit merely for possessing a new technology, rather than using it to make better designs."

— Edward Tufte, *The Visual Display of Quantitative Information*

INTRODUCTION: REVOLUTION AND REACTION

Within the discipline of Communication Studies, basic course pedagogy for visual aids does not seem to have evolved much beyond the era of the overhead projector. As a result, many of our graduates enter the workforce ill-prepared to effectively use high-tech presentation tools such as multimedia presentation software (Downing & Garmon, 2001).

The evidence of this shortcoming is three-fold. First, there is a remarkable dearth of scholarly disciplinary literature on the subject of visual aids (VA) in general and on presentation software in particular. The rapid growth in popularity throughout the 1990s of presentation software packages like PowerPoint has dramatically changed the nature of presentations in the working world (Shuell & Farber, 2001). Presentation software packages—chiefly Microsoft PowerPoint—have become the new visual currency for today's working communicators. PowerPoint alone is estimated to have captured 95% of the presentation software market, being installed on roughly 250 million computers worldwide. Microsoft itself claims that some 30 million PowerPoint "slideshows" are viewed around the world every day (Parker, 2001). PowerPoint is the vehicle of choice for today's presenters, be they Russian generals (Auletta, 2001), American clergy (Cobbs, 2002; LaRue, 2003), federal judges (Day, 2003), lawyers (Beard, 2002; Siemer & Rothschild, 2003), state officials in India (Field, 2000), the South Korean minister of

Information and Communication ("PowerPoint touted," 2003), research scientists (LaPorte et al., 2001), or medical school faculty members (Rodenbaugh, Collins, & DiCarlo, 2002). In short, the software has become the lingua franca of today's business presentation ("Power Play," 2001).

Remarkably, the true scale of this dramatic shift has barely registered (and then only of late) on the pages of journals like *Communication Education*, the *Quarterly Journal of Speech*, and *Communication Teacher*. For example, the second edition of *CommSearch* was published by the National Communication Association (NCA) in 1997 and contains complete title and keyword indexes for 24 of the discipline's journals, yet it contains no entries for the terms *PowerPoint*, *software*, or *multimedia*. Aside from a smattering of conference papers (e.g., Atkins-Sayre, Hopkins, Mohundro, & Sayre, 1998), Downing and Garmon's essay in the July, 2001 issue of *Communication Education* remains the sole article to date devoted specifically to the subject of teaching communication students how to use presentation software. Indeed, as they state:

> A neglected research area in the growing literature on the use of presentation software concerns the most appropriate training method to teach communication students how to use the software effectively. (p. 218)

Second, evidence suggests that the discipline's classrooms have only recently begun to address the subject of presentation software. On the whole, the discipline's VA curriculum continues to be premised on the existence of a now-outdated workplace where the most common visual aids were the overhead projector and the flipchart and 35 mm slides were considered exotic (Griffin, Petterssen, & Johnson, 1995). One study conducted by Cornell University found that a significant number of employers blame universities for producing graduates who are "computer illiterate," with some 75% of corporate recruiters needing prospective employees who possess basic presentation software skills (Davis, 1997). As Daly and Vangelisti (2003) note, technological change

always requires a corresponding change in the skill sets required of an effective communicator. Meanwhile, in the face of this gap, what little organized presentation software instruction there was seems to have fallen to a handful of private consultants and in-house corporate trainers (Collette 2000; McDaniel, 2002; Wolvin, 1981).[1] In many cases, it would appear that the typical workplace PowerPoint user is more or less self-taught, the recipient of little or no professional training.

Finally, a backlash has occurred in the workplace in reaction to what many regard as the abuse of presentation software as a communication tool. PowerPoint has actually been banned in some corporate settings due to ineffective use (Jaffe, 2000; Kellner, 2001; Parker, 2001). *FastCompany* magazine listed "investing too much power in PowerPoint" as one of the four deadly sins committed at off-site meetings (Dahle, 2001). Various allegations of misuse pepper the landscape of business journalism (Denison, 2000) and a number of business leaders have chosen to wash their hands of the new paradigm altogether, convinced that presentation software simply has no redeeming value (Stewart, 2001).

RATIONALE

It would seem that PowerPoint has become an object of great cultural notoriety, the visual aid people love to hate. "Too much PowerPoint is falling into the hands of amateurs, and they're cranking out slides with a vengeance," laments Maney (1999). "Really, all hell has broken loose," is the way the creative director of a Boston consulting firm put it, adding, "It used to be that designing a business presentation was a slow, deliberate process. Now anyone can create a PowerPoint presentation very quickly, and the design standards have really been dulled down" (Denison, 2000, first section, ¶10).

[1] Including the author, who taught PowerPoint to staff as a corporate trainer for EDS in 1994 and 1995.

This backlash, together with the paucity of scholarly literature on the subject and the lag in coverage by textbooks, suggests that despite the presence of communication consultants and the efforts of corporate training departments, presentation software instruction is not widespread, or is at the very least inadequate (Philipson, 2001; Barlow, 2000). Even one of PowerPoint's own early developers, embarrassed by the software's notoriety, confessed to Parker (2001, ¶9): "Oh, Lord. What have we done?"

As is probably inevitable with any new technology that spreads rapidly through a population, its "proper use" comprises two very different processes. On the one hand, there is the "operational" side, the side concerned with basic operation—how to start the thing, what buttons to push to make it "go," how to turn it off, etc. The other side of the coin is altogether different, being concerned not with operation but with production—the output or results you produce. The quality of these "outcomes" is in no way guaranteed by merely knowing how to operate something—operational success does not necessarily equal successful results. Knowing how to operate a lawnmower doesn't mean that you automatically have the sense to know how high or low to set the wheels on any given occasion. Nor does holding a valid driver's license ensure good motoring skills.

Perhaps a more literal analogy for our purposes is Dondis' (1973) call for "visual literacy," which he prefaced by noting that just because someone *can* push a button on a camera to snap a picture does not mean their pictures will be worth looking at—in other words our operation/production dichotomy. Put another way, it is the difference between being functional and being literate, between operating something mechanically and using it strategically. Thus what is needed—and what would seem to be missing from results-oriented technologies like presentation software—is strategy training. This kind of training emphasizes effective use beyond the basics of operation, focusing on the *why* of use more than (or as much as) the *how*. Returning to the driving analogy, the strategies

learned in defensive driving may do more to ensure the "effective use" of vehicles than almost anything contained in the owner's manual.

The presence of the current backlash seems to suggest that users have been equipped with few (or poor) strategies for using PowerPoint, that the focus of their "user training" has been operational rather than results-oriented; the technical manuals have gotten the lion's share of the education and training to date. As Williams (1985) reminds:

> Writers and researchers may seem preoccupied with new technologies, especially their physical and operational aspects. However, this is a necessary way station to proceeding with the study of how humankind communicates. The field of mass communication underwent a similar transition from a near-exclusive focus upon the medium rather than the human in the communications transaction. (p. 187)

Knowing how to launch PowerPoint, to create slides, choose templates, apply colors, add build effects, add sound effects, create transitions—or any of the host of possible operational choices—does not mean that you necessarily should do any of these things, nor does it guarantee that, for example, the template you pick will not make your text harder to read. The primary purpose of this study, therefore, is to address this "training gap" by proposing and testing several strategies that communication instructors could use to teach students to use presentation software more effectively, as measured by the results achieved.

As the arena where many people receive their only formal training in speech, it behooves the discipline to recognize the pervasiveness of the electronic presentation and respond by developing pedagogies for training students to use this new visual aid technology effectively. We have an opportunity as communication scholars to influence the ways in which this new visual aid is used even as we strive to become the ones primarily responsible for its pedagogy. This mission is consistent with our traditional emphasis on praxis; Hart (1981) observed that the discipline's founders "sought to

transmit practical knowledge; to help … students make a difference in the corporate, legal, and religious circles of the early twentieth century" (p. 37).

This viewpoint is echoed by former NCA president G. W. Friedrich (1989): "The role of speech communication has been defined by our response to student needs for assistance in mastering the skills of practical discourse" (p. 7). In keeping with this perspective, our present task as a discipline is to find a way to meet the practical communication skills needed by the "PowerPoint generation" of the twenty-first century (Downing & Garmon, 2001).

Before charting the future, however, this project will need to first consider the past by writing a brief history that traces how visual aids were conceptualized and taught from the time of the ancient rhetoricians to the time of the discipline's formal founding early in the 20th century. This chronology will be the focus of Chapter 2.

The third chapter will trace the further development of visual aids once the framework of a formal academic discipline was in place, paying particular attention to how this development was reflected in the discipline's textbooks and scholarly literature. Chapter 3 will also consider how dramatic changes in technology and society created a new context for public speaking even as it simultaneously provided a host of new tools for public speakers to use. It is within the confines of a formal speech communication discipline that visual aids first emerged as their own discrete subject matter, finally distinct from speech elements like gesture and other forms of physical action, as had been their lot since antiquity. Chapter 3 also looks at how the discipline of Communication Studies (CS) dealt with visuals as a pedagogical tool, including the all-important question of whether their use positively influences the learning process. Over the years, CS practitioners have carried out surprisingly little research into questions such as these.

Chapter 4 considers the present "PowerPoint era" of visual aids and what implications it might have for us as communication scholars. Here the PowerPoint backlash will be revisited as we consider the intellectual responsibility we bear to properly investigate the reasons for the backlash. We will find that the question of whether PowerPoint is an effective learning tool has been largely overlooked in the midst of our rush to accept this technological and cultural phenomenon.

Building on Chapter 4's assertions, the fifth chapter isolates two elements relevant to slide layout—font style and color contrast level—and proposes an experimental design aimed at testing whether certain combinations of these two elements have a statistically significant effect on: a) comprehension (learning), both short term and long term, and b) overall levels of satisfaction with the speaker-and-slides learning format.

Chapter 6 analyzes the data gathered in the experiment proposed in Chapter 5, and Chapter 7 concludes the dissertation by discussing and interpreting the collected data and speculating on future avenues of research that the findings may suggest.

Chapter 2:
The Discipline's Historical Relationship to Visual Aid Instruction

"The soul never thinks without an image."

— Aristotle, *On the Soul*, Book III, Part 7

BODIES AS VISUALS IN GREECE AND ROME

The intellectual traditions that preceded the formal rise of the discipline endorsed the notion that the speech act could contain a visual component. Though the phrase *visual aids* is a twentieth century label (Weber, 1930), *visuality*, as it were, has played a role in public speaking since the ancient Greeks "invented" oratory in the fourth and fifth centuries BCE (Murphy, 1972). In classical Greece and Rome, a culture which venerated the body as a source of great authority (Bremmer, 1991), effective use of visual communication tools meant using one's body (and occasionally one's clothing) in certain ways. If the tale of first-century biographer Plutarch is true, for example, the orator Hyperides (390-322 BCE) may have been among the first in recorded history to use the human body as a persuasive visual aid. In court to defend the beautiful courtesan Phryne against charges of impiety, and sensing an impending guilty verdict, Hyperides rushed his client into the courtroom and bared her breasts before the judges—who then summarily acquitted her (Clough & Goodwin, 1905); all this from a man who, according to Plutarch, "never affected much action in his orations" (p. 57).

According to Aristotle, "Those who heighten the effect of their words with suitable gestures, tones, dress, and dramatic action," could be especially effective at stirring an audience's emotions (*Rhetoric*, Book II, Ch. 8, ¶3). In classical times, communicating visually often meant creating mental images for audiences. Again,

Aristotle: "When the mind is actively aware of anything it is necessarily aware of it along with an image; for images are like sensuous contents except in that they contain no matter" (*On the Soul*, Book III, Ch. 8, ¶4).

Some two centuries later, the Romans built their rhetorical theories on Greek foundations. For his part, Cicero (106-43 BCE) saw potential for great communicative value in physical action (Golden, Berquist, & Coleman, 1993). *Est enim actio quasi sermo corporis*—roughly translated, *by action the body talks*—he wrote in *De Oratore* (Book III, Sec. 59). Another century and a half later, Quintilian (42-118 CE) discussed both voice and gesture in his exhaustive treatise *Institutio Oratoria*, including a rare but noteworthy discussion of a visual aid other than the body—how to make the most persuasive use of one's toga (Graf, 1991). Quintilian was especially fond of the relatively obscure Greek notion of *cheironomy*, or the art of bodily movement, which he called "the law of gesture" (Hawhee, 2002). Between Cicero's time and that of Quintilian, the anonymously-authored *Rhetorica ad Herennium* (85 BCE) gives one of the most detailed treatments of delivery to be found in antiquity, including the assigning of specific gestures to each of eight different tones of voice (Rollinson & Geckle, 1998).

Reviewing these passages from antiquity, it would be a stretch to suggest that effective use of visual aids was central to speech instruction in the classical period; there are at least two reasons for this. First, our conception of visual aids does not neatly fit with their notions of visuality as theirs seems to have been limited to body-centered, physical complements to speaking such as gesture; the Romans in fact grouped these nonlinguistic behaviors together under the label of *actio* (Duranti, 1989). Thus, where we might think of these behaviors as forms of visual communication, the Romans at least seem not to have carried it that far.

The second reason why effective use of visuals were not emphasized in the classical period is that the rhetorical canon that governs the visual aspects of communication—delivery—was sublimated to other more strictly oral canons like invention, arrangement, and style (Golden et al., 1993). Greece and Rome were premodern societies and as such were primarily oral cultures (Ong, 1977; Finley, 1989). In such a setting, it would seem, the primary focus of communication strayed little beyond the vagaries of language itself.

The rhetoric practiced by figures like Plato, Aristotle, Isocrates, Cicero, and Quintilian, though it varied greatly among them, was primarily a philosophical rather than practical enterprise—a vehicle of statecraft and a way of knowing more than a set of skills to be acquired. This view of speech is particularly true of Isocrates (436-338 BCE), the father of the rhetorical education and perhaps the first significant speech teacher known to history. Not even physical action seems to have garnered his attention as there are no references to devices such as gesture in his extant works.[2] Why this absence is the case is ultimately a matter for speculation, but it may be because he considered a speaker's success to be more the product of natural ability than training (Murphy, 1972), because of his distaste for the excesses of sophistry (Bizzell & Herzberg, 1990), or because of the weakness of his own physical voice (Poulakos, 1995).

As Peters (1999) notes, despite the fact that Aristotle referred to humans as "speaking animals," the notion that people communicate with each other (a premise as central as any to our discipline) did not materialize until late in the 19th century. Another way of putting this argument is to say that visual aids would not become a cognitive construct for rhetoric until the modern concept of communication became a part of

[2] The three-volume Loeb Classical Library edition of Isocrates' works (see References) is considered a definitive collection, and is indexed. A search of the index finds no references to *delivery*, *gesture*, or *image*, only one reference to *voice*, none for *memory*, and two for *style*.

rhetoric. The advent of communication, moreover, was in Peters' view the catalyst for releasing speech from its focus on the body, a move which then opened the way for expanded notions of visuality that 20th century media technologies would help to realize.

For all intents and purposes, our present-day conception of visual aids developed only in the 20th century, after emerging technologies for the mass production of audiovisual media coalesced in ways that were directly relevant to the process of communication. By the middle of the 20th century, communication skills were quickly becoming the coin of the realm in an increasingly competitive business economy. Simultaneously, the mass production and wide availability of various media made visual communication as easy as it was practical. Premodern Greece and Rome knew no such exigencies.

Nevertheless, the Roman and Greek rhetoricians of antiquity have a secure place in the evolution of visual communication as they were the first to consider, if ever so briefly, the rhetorical power of the body, including gestures, facial expression, and more (Rollinson & Geckle, 1998). By doing so, they would set the theoretical stage for what visuality would become, within the discipline of Communication Studies, more than two millennia later. Throughout the classical period rhetoric remained a new, largely inchoate art, in a culture that had relatively limited potential for developing media. Rhetoric would therefore remain a primarily philosophical, even spiritual, endeavor. In the view of scholars like Peters (1999), only the advent of mass media in the 19th and 20th centuries would recast rhetoric as a person-to-person enterprise. Given this perspective, that the early practitioners of rhetoric even managed to posit a connection between speech and visuality, however tenuous, is perhaps more than we could have reasonably expected.

VISUALITY FROM THE MIDDLE AGES THROUGH ELOCUTION

The three centuries after Quintilian marked the gradual decline of Rome. After Rome fell early in the 5th century, the business of rhetoric became the purview of the Early Church. This was the era of Augustine, a rhetoric professor who taught in Rome and Milan before converting to Christianity in 386. For Augustine, rhetoric's purview was interior rather than exterior things, with the mind and with language more than with the body. The latter, it seems, was a necessary evil in this equation, literally a contrivance:

> For to what else do we direct our efforts then, but to bring our own very mind, if it can be done at all, in upon the mind of the hearer… . This we do, making the attempt both by words, and by the simple sound of the voice, and by the countenance, and by the gestures of the body,--by so many contrivances, in sooth, desiring to make patent that which is within… . (*De Fida Et Symbolo*, Ch. 3)[3]

Augustine's reinvention of rhetoric would establish it as a tool for studying scripture and knowing God, a practice that would continue unabated for centuries to come (Kennedy, 1995).

As global commerce began to pick up steam in the Middle Ages, the need for effective communication grew as well, but this need was met primarily through the art of letter-writing rather than oratory. Caught in the twin orbits of commerce and religion, the work of rhetoric in the Middle Ages focused on the creation of guides for letter-writing and, for the Christian orator, manuals on preaching (Bizzell & Herzberg, 1990). The recognition of visual forms of communication as an aid to speech continued to be absent from the works of rhetoricians.

The 16th century French philosopher Peter Ramus advocated eliminating from the study of rhetoric everything but style and delivery, setting the stage for the rise of the delivery-centered elocutionary movement of the 18th and 19th centuries (Golden et al.,

[3] Source: *Early Church Fathers, v. 2.0*. Retrieved March 15, 2003 from http://www.ccel.org/fathers2/.

1993), the rhetorical epoch that preceded the rise of our own. Where there had a been a dearth of visual aid instruction since the time of the ancients, under Elocution this trajectory dramatically reversed (provided we classify gesture as a visual aid for our purposes). Under the auspices of the elocutionists, delivery (including gestures and other forms of action) became virtually the sole concern of rhetorical scholarship and practice (Cohen, 1994). John Henley wrote a popular essay on "publick" speaking that was published in London in 1727. The extended title included not only the word *action* but also the noteworthy phrase, "as to his pronunciation and gesture."

Henley's was one of many such instructional manuals written during this period. The rhetorical value of physical actions and gestures reached a high water mark of sorts with the publication in 1806 of Gilbert Austin's 600-page *Chironomia*. Austin's work sought to elevate the canon of delivery, particularly where gesture was concerned, to the status of a science (Bizzell & Herzberg, 1990). Though British in origin, the elocutionary movement found fallow ground in the United States, becoming the predominant method for public speaking instruction in the 19th and early 20th centuries (Cohen, 1994).

Instruction in proper delivery, including both the voice and physical elements such as gesture, would remain the chief concern of elocutionary rhetoricians throughout the two-hundred-year span of the movement. Popular elocutionary authors like Hamill[4] (1890) and Delsarte gave great deference to both the vocal and the physical aspects of delivery. Works like the *Delsarte System of Oratory* (Delaumosne, 1887) would remain influential within the discipline well into the 20th century (Cohen, 1994). Ostensibly a treatise on oratory, fully three-fourths of Delsarte's text was devoted to a discussion of gesture.

[4] A highly regarded teacher, Hamill's students included such cultural luminaries as William Jennings Bryan (Trueblood, 1926).

Despite the lingering influence of such works, by the time CS became a discipline in 1914, the elocutionary approach to rhetoric was officially in decline, and many of the national association's early members were eager to break with the traditions of the movement (Jeffrey, 1964/1989). Andrew Weaver, who was present at the national association's founding in 1914 and became its president in 1927, referred to the work of the elocutionists as "half-horse-half-alligator antics," accusing them of "artificial and extravagant exhibitionism" (1959/1989, p. 14). Due in large part to this kind of reaction against the perceived performative excesses of Elocution, when the first true CS textbooks were written in the 1930s, the canon of delivery no longer received the kind of attention it had in the two centuries prior. Until then, however, it would take time for the discipline to write and popularize textbooks that fully reflected the new discipline's priorities.

NEW DISCIPLINE, OLD BAGGAGE

In the mid-1910s, when what is now NCA was formed, those interested in teaching public speaking had primarily two kinds of textbooks available to them—outright elocutionary handbooks or English composition books. Instructors drew from both pools until the new generation of public speaking texts gradually gained ascendancy. The focus of texts such as Esenwein and Carnagey's *The Art of Public Speaking* (1915) and Lewis's *A Handbook of American Speech* (1916) remained essentially unchanged from the traditional elocutionary perspective. The fingerprints of Elocution were also visible in successive printings of Winter's *Public Speaking: Principles and Practice* in 1912, 1915, and 1925.

Quite separate from the elocutionary texts were the English composition titles. As Cohen (1994) notes, popular English composition texts often treated oral discourse,

particularly debate and argumentation. As keepers of the tradition of original speechmaking (as opposed to Elocution's focus on oral interpretation) and canons like invention and arrangement that Elocution had neglected, such English composition titles were a logical starting point for CS teachers who were developing curricula for oral discourse classes.[5]

English composition texts were also decidedly anti-elocutionary, a viewpoint that only exacerbated the discipline's mistrust of grand visual display. In a popular 1908 text entitled *Argumentation and Debate*, for example, William Trufant Foster took the following shot at Elocution's preoccupation with delivery and resultant over-emphasis of gesture (quoted in Cohen, 1994):

> In debating, no gestures are necessary. If any come in response to the thought or feeling of a man as he speaks, and if these appear natural to the audience, so much the better, even though they are not labeled and depicted in books on gesture. (p. 15)

When it came to teaching delivery, Foster seemed inclined to throw the baby out with the bath water altogether: "All training in spoken discourse—however its name may shift with the winds and tides of popular disapproval—should be subordinate to training in thinking" (in Cohen, 1994, p. 26). Indeed, focused as they were on theory, many of these texts did little to distinguish between the responsibilities of speakers vis-à-vis those of writers (Friedrich, 1985). According to Bochner and Eisenberg (1985), the first "serious" attempt to loose the discipline form its moorings in English composition didn't occur until the mid-1920s. Thus the first generation of textbooks used by the discipline did not employ "visual aid" language or concepts beyond physical action such as gesture, and obviously some, such as Foster's, even denigrated it. In sum, the early CS texts that

[5] An early example of this evolution from English composition to spoken rhetoric text is J.M. O'Neill's 1917 "complete re-writing" of Laycock and Scales' (1904) *Argumentation and Debate*. O'Neill was the first president of what is now the National Communication Association.

hailed from the elocutionary tradition retained some elements of delivery training while those titles inherited from English composition did not tend to deal with such matters.

But by 1935 there were more than 200 American colleges and universities with formal departments of Speech (Griffin, 1994). Having thus established this firm presence, the discipline began to claim a legitimate place for itself in academe, casting off the mantle of Elocution and simultaneously developing a scholarly identity that made it more than merely the "oral version" of the English departments. A new and broader conception of "speech" began to take hold. With this academic trend in full swing, the first modern generation of public speaking textbooks began to come into its own. The sense of visuality present in these texts, however—to the extent it was present at all—would continue to maintain for another two decades the virtually exclusive focus on the body that the discipline inherited from the elocutionists.

A PRACTICAL DISCIPLINE, A NEW ENVIRONMENT

To free visuality from the body-centered concept it had been since antiquity in general and since Elocution in particular, a confluence of historical, intellectual, and cultural trajectories would occur. First, as was beginning to happen in the 1930s, the discipline would need to complete its break with the intellectual traditions that preceded it and stand on its own two feet academically. The second causal factor was a uniquely 20th century phenomenon—the development and popularization of new visual technologies courtesy of a maturing Industrial Revolution. It would only be as these new visual technologies emerged in the 20th century that the discipline would begin to incorporate them into the curriculum, making room for them within the age-old rhetorical canons—effectively new wine in old wineskins. Third, as discussed previously, the intellectual birth of concepts like *communication* made it possible for the technological

windfall of the Industrial Revolution to find a useful home in a burgeoning, praxis-oriented discipline. In effect, the emergence of a new *context* for visual aids caused the *definition* of visual aids to be altered (from bodily gestures to portable media), accelerated by the fact that there were now more would-be speakers with more to say (perhaps) and more ways to say it than at any time in history to that point. This change was part and parcel of the synergy of the three trajectories identified above—the emergence of public speaking instruction out of the old rhetorical traditions, the new awareness of communication as a practical, personal art (Peters, 1999), and a technological revolution that would fundamentally change the way daily life had been lived by most people throughout the balance of pre-industrial, premodern history.

At this point, it will be useful to survey some of these dramatic technological changes in more detail and plot their emergence in the pages of Communication Studies textbooks and scholarly journals. Doing so will help us better understand how visuality went from being "gestures and togas" for two thousand years to—in the space of mere decades—photographs, slides, flipcharts, films, and overhead transparencies. More importantly, we will gain an appreciation for how the discipline responded to these emergent technologies and incorporated them into its pedagogy, and in so doing established precedents that may be useful for us to recall today. A survey of the changing relationship of the discipline to visual aids and VA instruction, from the early 20th century until the advent of the PowerPoint era, is the focus of the next chapter.

Chapter 3:
The Discipline's Handling of Visual Aids in the Modern Era

"The proper focus in the study of communications technology, consonant with the long tradition of rhetorical theory and modern speech communications, is the human transaction."

— Frederick Williams (1985, p. 187)

VISUALITY IN THE DISCIPLINE'S FIRST DECADES

As we noted earlier, because of the lingering effects of Elocution and the roughly twenty years it took for CS to establish itself as a discipline separate from written English, most of the textbooks used and/or written between NCA's founding in the mid-1910s through the decade of the 1940s maintained the traditional body-centered focus on visuality, treating gesture almost exclusively, if the subject came up at all. "Visual aids" as such were simply not on the discipline's radar. Yet it must be noted that in the discipline's first decades, roughly the first half of the 20th century, visual aids were not really on the larger society's radar either (Postman (1985) calls the second half of the 20th century "the decline of the Age of Typography and the ascendancy of the Age of Television" (p. 8)). In Ong's (1982) terms, we were a "literate" society, rather than a visually oriented one. The medium of photography, for example, though extant in various instantiations from the 1830s on, had only come to the masses with the introduction of Kodak's Brownie camera in 1900 (Smith, 2002). 35 mm color slides weren't introduced until 1936, and Kodak's famous (or by some accounts, infamous) line of Carousel slide projectors didn't debut until 1961 (Kodak.com).

But things would begin to change as the practitioners of Communication Studies entered the post World War II era (Kenney & Scott, 2003). The break with Elocution and

English composition had in a sense freed the new field to revisit all the rhetorical canons, including delivery, on the discipline's own terms. This new intellectual climate was significant enough, but for our purposes its real power lay in the fact that it prepared the intellectual soil of the discipline for the revolution in media technologies that was beginning to get underway. With the advent of mass media and the dawning of the Information Age, speech teachers would find that what constituted the "available means of persuasion" was expanding in new and dramatic ways. To a discipline that was founded and for many years weaned on the practical aspects of public speaking,[6] the communicative potential of these new technologies would ultimately prove impossible to resist.

In the beginning, however, what was to become the eventual marriage of visual aids and speech instruction was a long, slow courtship. The discipline's journal articles and textbooks tell the tale well enough. Doing a detailed survey of CS basic course texts used in the period, however, is a daunting task beyond the scope of this present proposal. Without access to records of book orders or old syllabi, it is equally difficult to assess a text's popularity (presumably also a measure of pedagogical influence). We can, however, take cues in these areas from historians of the discipline. We can also work from the premise that textbooks authored by persons who were or would become national association presidents would accurately represent the general direction of the discipline's pedagogy at a given moment in time. This approach may be especially productive when we have the opportunity to trace the evolution of particular authors and/or texts over

[6] When the Quarterly Journal of Speech began publication in 1915, it did so as *QJPS*, the *Quarterly Journal of Public Speaking*, and an analysis of the table of contents of the first ten volumes shows nearly two-thirds of articles devoted to topics such as public speaking, debate, and the oral interpretation of literature. That same year, the first annual convention itself featured sessions devoted to the basic course, oratory, stage management, and presentation styles (Jeffrey, 1964).

successive generations. In some cases this metric will allow us to map, through a single lens, more than fifty years of changing pedagogical focus vis-à-vis visual aids.

COMMUNICATION STUDIES TEXTS INTO THE 1950S

Cohen (1994) identifies *Public Speaking* (rev. 1917), written by national association co-founder and future president J.A. Winans, as the first true textbook to emerge from within the discipline proper, and the one which by some accounts dominated the discipline until the 1930s (P.H. Gray, personal communication, May 11, 2002). Its delivery chapters, however, dealt with visuality only in the elocutionary sense of gesture and "platform manners," and it contained no index entries under either the general heading of vi*sual aids* or more media-specific headings like *blackboards*, *photographs*, *diagrams*, *maps*, or *objects*. The same gaps can be observed in Winan's *A First Course in Public Speaking* (1931).

By most accounts, William Norwood Brigance, who served as national association president in 1946 (Work & Jeffrey, 1989) was a central figure in the history of the discipline's textbooks. Indeed, when one considers the staggering number of volumes he wrote or co-authored over the years, it is hard not to regard his writings as a good bellwether for that of the discipline at large. Reflecting on the discipline's history at its 75th anniversary in 1989, Auer points to four of Brigance's many textbooks as representative of the discipline's gradual shift in pedagogical focus from speaker-oriented to socially oriented. For our purposes, three of these volumes will allow us to construct a similar arc for studying the evolution of visual aid pedagogy: *The Spoken Word* (1927), *Speechmaking Principles and Practice* (1938), and the Cold War era's *Speech: Its Techniques and Disciplines in a Free Society* (1952).

In terms of visual aid pedagogy, the first of these books, *The Spoken Word*, differs little from the Winans text that preceded it by a dozen years. In fact, it is even less visual, making no formal mention of gesture or physical movement in its 300-plus pages. *Speechmaking Principles and Practice* (1938), however, is far more visually-oriented, though it stops short of dealing with media other than clothing. Still, Brigance opens with delivery (physical, at that) rather than treating it as an afterthought, and even refers to gesture (which he discusses extensively) as a form of "visual communication" (p. 80).

But with the publication of his *Speech: Its Techniques and Disciplines in a Free Society* in 1952, the dam finally burst; in it Brigance devoted almost six pages to "Supporting ideas with visual aid material," including charts, diagrams, maps, models, pictures, films, and slides (pp. 260-66). Interestingly, he introduces his discussion by including the following admonition, printed two years earlier in the *Quarterly Journal of Speech*, from J.R. Van Pelt (1950):

> We have seen overcrowded slides projected by machines that could not be focused. We have watched while speakers in a large room tried to use maps or charts that could not be read beyond arm's length. We have listened in vain as able scholars talked confidentially to a blackboard while writing illegible symbols with invisible chalk. We have fidgeted, mentally if not physically, as the remarks of a renowned scientist came to a dead stop while he readjusted some ill-arranged piece of apparatus or hunted for a scientific specimen to illustrate his point. The habit of using bad visual aids is rampant among those who 'speak to inform.' (p. 45)

Almost from the beginning, it would seem, visual aid pedagogy was regarded as something of a two-edged sword within the discipline. Furthermore, that such tools could actually effect improved learning seemed to be more or less taken for granted.

The Van Pelt article is significant because it represents one of the earliest treatments of mediated visual aids in the discipline's literature. The honor of being the earliest essay on the subject, however, may go to Simmons (1943), who wrote a brief

piece on “The nature and use of audio-visual aids in speech instruction” in the *Southern Speech Journal*.

Curiously enough, within the academy the earliest occurrences of visual aid terminology in the modern sense—as mediated objects a speaker manipulates—first appear not in the field of communication but in the discipline of education. As photography and film gained greater status as mass media, their influence began to trickle into the classroom. Among the first chronicles of this technological beachhead was Weber’s remarkable (and *mimeographed*) volume, *Visual Aids in Education*, published in 1930. The book was devoted to “scientific considerations of the values, uses, and limitations of the major visual aids, namely, drawings, photographs, stereographs, lantern slides, and motion pictures” (p. 4). Johnson (1927) had noted that in earlier research, Weber had found that the use of relevant films seemed to increase the effectiveness of lesson material.

An even earlier entry is the scholarly journal *The Educational Screen*, published in Chicago beginning in 1922 and dedicated to helping educators stay “in touch with everything that points toward progress in this undeveloped and more or less unknown field [of visual aid instruction]” (January 1922, p. 5). Its inaugural issue found the discipline of education positioned on the technological frontier, facing a new communication technology—primarily motion pictures—with uncertainty, but recognizing that, ready or not, this change was a certainty, that there was no avoiding its arrival and eventual pervasiveness. Some eighty years later the analogies to the present situation are striking:

> The intrinsic value of the movies matters not at all. It matters not whether the motion pictures are a poison or an inspiration, a curse or a blessing, an industry or an art. Whatever they are, they are exercising a tremendous influence—as yet uncalculated and perhaps uncalculable—upon the mentality of millions in this

> nation today. …The screen educates—for better or worse—wherever it hangs. (p. 7)

If we apply this argument to the present milieu, we find that even as critics like Nunberg (1999) and Tufte (Corcoran, 2000) voice concerns about the very nature of presentation software, they are in a larger sense missing the boat. For his part, Nunberg writes:

> The more PowerPoint presentations you prepare, the more the world seems to package itself into slide-sized chunks, broken down into bullet items or grouped in geometric patterns that have come to have almost talismanic force. A friend of mine who works for a large Silicon Valley company maintains that no proposal can win management buy-in until it has been reduced to three items placed along the sides of a triangle. You could think of all this as the New Illumination. In many ways we've become the most visual culture since the High Middle Ages. Still, we probably don't want to toss out all the achievements of the age of print. When you move from connected text to bullet items you leave some useful communicative tools behind—verbs, for example. (¶9)

Yet Nunberg and Tufte write from the parochial perspective of readers, not viewers, and certainly not speakers. This position seems somewhat arbitrary, moreover, when one considers that Plato, in his own day, distrusted the "new technology" of writing (Postman, 1992). Furthermore, what critiques like Nunberg's and Tufte's seem to be doing is factoring the speaker out of the communication equation (whose job it is, by the way, to supply the audience with Nunberg's AWOL verbs).

Against such fundamental philosophical differences there may be no effective counterargument. But we bypass such reservations if, for pragmatic purposes, we cede the cultural inevitability of a given technology's acceptance. And indeed, it does not strain credulity to suggest that, by almost any reasonable standard, multimedia presentation software seems as though it is here to stay. From a communication perspective, this technology has become for some today what writing was to Plato.

TURNING OF THE VISUAL TIDE: THE 1950S THROUGH THE 1980S

As we saw with the Brigance (1952) text and the appearance of articles like those by Simmons (1943) and Van Pelt (1950), a new understanding of visual aids and of the discipline's relationship to them was beginning to emerge mid-century, after first surfacing in the discipline of education several decades earlier. All of these occurrences were responses (some delayed, some more immediate) to a nascent technological landscape that by mid-century had begun to burgeon dramatically. According to Smith (2002), the span of 1900 – 1960 saw, among other things, the introduction not only of instant photography and color film, but also the assembly line, television, talking motion pictures, transistors, and lasers (to name only a few). It wasn't until this same period, moreover, that widespread electrification became a reality.

It would take time for these developments to take root and mature, receiving perhaps their biggest boost in this regard from the post-war boom culture of the 1950s—the era in which American consumers first began their life-long affair with technology. Radio was already well-established, but technologies like television were now poised to literally explode onto the scene. According to the University of Colorado at Colorado Springs, 7,000 television sets were sold in America in 1947. Three short years later, that number was seven million. And by 1960, even 80% of *rural* homes had TV. In the second half of the 20th century, persuasion (i.e., rhetoric) would grow increasingly visual in nature (Kenney & Scott, 2003). In the history of the discipline, and in the whole history of visual aids to that point, this shift was unprecedented.

It would seem that until visual technologies became an integral part of everyday life—and even after—the discipline of Communication Studies treated the use of visual aids as a novelty worthy of a postscript rather than as a fundamental part of the curriculum. A typical example is the fourth edition of Oliver, Zelko, and Holtzman's

popular standard, *Communicative Speaking and Listening* (1968). Of its 314 pages only four are devoted to visual aids.

Other authors in this era treated tended to treat VA as an afterthought as well. In the 1974 edition of their text—well into the "audiovisual" era inaugurated by the advent of the overhead projector and slide carousel in the 1960s—Monroe and Ehninger dedicate an even smaller percentage of their overall discussion to the topic than did Oliver et al. (a mere five out of 607 pages), burying the discussion under the ambiguous heading, "Nonverbal Supporting Material."

Throughout the 1970s and into the 1980s, as VA technology began to multiply and become more and more a part of everyday life, there seemed to be little attempt to stop and reconsider whether all of this technology was any more useful to the learning process than good old-fashioned gesture-aided oratory had been throughout speech communication's long history. In some circles, in fact, the tendency was to immediately find ways to put the new technologies to use; in 1984, for example, Behnke and O'Hair wrote a glowing homage to the spate of new technologies that possessed an apparent relevance to the field of Communication Studies. "In many ways," they wrote, "communication instruction is undergoing a major media revolution" (p. 173).

But embracing real-world technologies was something the discipline of Communication Studies was doing long before we went by that name. In fact, Cohen (1985) suggests that our pointed lack of social-scientific research on questions like visual aids efficacy is to be expected of a discipline that was born out of praxis:

> Speech began as an applied field and turned to the development of theory, research, and criticism only after it had established itself as a profession. …We perceived ourselves as a performance field. Our concern with research and scholarship was secondary. …Speech communication still displays a good deal of ambivalence about whether its primary objective is to teach skills, to advance scholarship, or somehow to combine both of these goals. (pp. 287-288)

Yet it must be noted that the discipline's literature is not entirely lacking when it comes to providing at least general proof of the efficacy of visual aids for learning. Among the handful of studies cited is research conducted by Dwyer (1970), who found that the use of visuals did make a positive difference in increasing student (audience) achievement. Dwyer found that simple, accurate illustrations containing a minimal amount of realistic detail were more effective than complex, highly realistic ones provided that the setting is a group learning situation; i.e., the time spent on the material was externally controlled (by a teacher) and equal for everyone.

Dwyer's explanation for this phenomenon could be labeled the Dragnet effect—given a limited amount of time, students do best when visual materials present "just the facts," stripped of any details that are not relevant to the learning objectives immediately at hand. His research led him to offer the following general observations (p. 247):

1. The use of visuals to complement oral and verbal instruction does not automatically improve student achievement.
2. Different visuals differ in the effectiveness with which they promote achievement of learning objectives.
3. The effectiveness of specifications [types] of visual material depends on the method used to present this material to the student.

Linkugel and Berg (1970), focusing on retention rather than achievement per se, reported the results of a 1967 study by Robert S. Craig that seemed to clearly make the case for the efficacy of visuals, at least at a basic level. The findings were as follows:

> …when knowledge was imparted to a person by telling alone, the recall three hours later was 70 percent, and three days later, only 10 percent. When imparted by showing alone, the knowledge recall three hours later was 72 percent, and three days later, about 35 percent. …When both telling and showing were the teaching tools, the recall three hours later was 85 percent, and three days later, 65 percent. (pp. 68-69)

On the heels of these studies came research by Seiler (1971), who found that even though visuals can affect elements such as attitude change and speaker credibility, they may have little or nothing to do with retention of material. He concluded his discussion section with this somewhat consternated observation: "the precise conditions which lead to changes in credibility or attitude and not knowledge, or to changes in knowledge and not credibility or attitude are yet to be explored" (p. 334).

Ten years later, Bohn & Jabusch (1982), cognizant of these studies as well as a handful of others dating back to the 1950s and 1960s (e.g., Dale, 1969), sought to "provide direct experimental support for or against the incorporation of visual materials into a lecture" (p. 254). They compared results from four versions of the same lecture material—*written*, *oral*, *demonstration*, and *multimedia*.[7] Based on their results, they made the following observations (p. 265):

1. We should avoid having students simply read lecture material (the other three lecture types were superior)
2. Demonstration lectures and multimedia lectures are superior to both oral lectures and written lectures
3. There appears to be no significant difference between the efficacy of the demonstration lecture vs. the multimedia lecture
4. Professional-looking multimedia materials may acquire "a life of their own" and actually distract from the message's effectiveness

It is into this fairly nebulous and somewhat contradictory milieu, then, that PowerPoint comes. The application was first introduced in the late '80s but did not enjoy widespread popularity until it became a staple of Microsoft's *Office* software suite in the early to mid-'90s.

[7] Meaning the lecture is accompanied by overheads, slides, and "handsome" charts (pp. 264-265).

Despite (or perhaps because of) this mere handful of studies, many of the arguments used by CS practitioners to support the use of visual aids have been qualitative rather than quantitative. In a pseudo-scientific move, for example, Ehninger, Gronbeck, McKerrow, and Monroe (1986) resort to the anthropological maxim that the use of visual symbols to communicate preceded the development of written and spoken language. The implication of course is that visual communication is not only on par with its verbal counterpart, but also superior in some ways. Even the speaker, they point out, is read as a "visual message" by the audience (p. 246). And in their separate, earlier volume, Monroe and Ehninger (1974) tout the ability of films to show action, of physical objects and certain types of illustrations to promote three-dimensional realism, and of slides to add interest and promote understanding—but absent all evidence demonstrating why, or even if, these characteristics enhance learning.

INTO THE 1990S: THE POWERPOINT ERA BEGINS

Twenty years later, just as PowerPoint was beginning to get a full head of steam, much of this same accepting attitude toward visual aids is evident in popular texts like the fourth edition of Ayres and Miller's *Effective Public Speaking* (1994). Though multimedia presentation software is nowhere to be found among the authors' extensive discussion of visual aid types, they preface their chapter by summarizing the scant research on visual aid efficacy that had been done in (or near) the discipline to date (all of the studies they cite have been discussed above).

An informal survey of other basic course textbooks from the 1990s reveals that by decade's end PowerPoint—by then nothing less than a cultural phenomenon—was starting to get the attention of the discipline's curriculum writers. Nicholls (1999) and Grice and Skinner (1998) both devote about a page to PowerPoint, describing its

capabilities in glowing terms. "Computer technology has revolutionized the production and display of visual aids," declare Grice and Skinner somewhat understatedly at the beginning of their discussion (p. 297).

Gronbeck et al. (1997) do not mention PowerPoint or its equivalents by name, but do generically address the general thesis of "computer-generated visual materials" and offer some (unsupported) guidelines for how they should be used. It should be noted that the Gronbeck book was the *thirteenth* edition of what may be the best-selling speech communication title in history. Hence, it may have been more oriented to its earlier editions from the pre-PowerPoint era than some of the more recently created titles like Nicholls' and Grice and Skinner's.

As we will see in the next chapter, as the calendar passes through 2000, CS textbooks start paying more and more attention to PowerPoint. Not only do they begin to provide more detail about its features, but they also begin to develop a more critical attitude; the narrative becomes more cautionary in tone, encouraging speakers to be more discriminating about their choices and reminding them to keep the speech act in perspective—that it is still, in the end, always about the audience.

Audience effects, chiefly of the PowerPoint variety, are precisely what Chapters 4 and 5 will consider. The blip on the discipline's radar that electronic presentation software was at the end of the 1990s was about to become a full-scale invasion. For better or worse, PowerPoint and its ilk had become too prominent a phenomenon for CS scholars to ignore. But as we shall see, our reaction to date has largely consisted of taking this powerful new visual technology for granted, assuming—rather than knowing—that using it is the right thing to do for our audiences.

Chapter 4:
The New Era of Visual Aids

"The inventors of PowerPoint are probably amazed at the success and debate surrounding their creation."

— Mark Hollands, *The Australian*

A Scholarly Call to Arms

The day of the overhead projector is at an end; in its place comes the era of the multimedia presentation (Ho, 2001; Wiggins, 1997). "I was in my second year of teaching before I was able to do a presentation like this," an education specialist told a reporter for the *South Bend Tribune* (who was writing an online article). "Now, you have 7-year-olds doing PowerPoint" (Bradford, 2003). PowerPoint has even altered the landscape of that bastion of staid, stolid presentations—the military briefing. "There's an arms-race dimension to it," says Duke University military expert Peter Feaver. "If there are three briefings in a row, and you are the one with the lowest production values, you look really lame" (Jaffe, 2000).

But as a visual aid and learning tool, PowerPoint—the de facto definition of a multimedia presentation —is at a crossroads. As we saw in Chapter 1, PowerPoint has inspired a new presentational style that has become nothing short of a cultural phenomenon. But we also saw in Chapter 1 evidence of a growing backlash against PowerPoint. For example, the multimedia revolution finally became more than Joint Chiefs Chairman Hugh Shelton could bear; he ordered that PowerPoint slides be stripped of everything but the necessary information—no bells and whistles—in hopes of conserving precious e-mail bandwidth (Jaffe, 2000). Backlash, indeed—it seems

unlikely that articles were written in the 1960s and 1970s decrying the "tyranny" of overhead projectors and transparencies (Simons, 2001).

The backlash is a drumbeat that grows louder and louder (Denison, 2000), fueled in part by renewed attacks from design guru and PowerPoint arch-critic Edward Tufte. The Yale professor recently published a 20-page monograph titled *The Cognitive Style of PowerPoint* (2003) in which he bemoans the new paradigm created by the advent of presentation software. "Slideware" programs, as he and others have attempted to pejoratively label them, "usually weaken verbal and spatial reasoning, and almost always corrupt statistical analysis" (p. 3).

Strictly cognitive issues notwithstanding, he quickly indicts PowerPoint from a communication perspective as well: "PowerPoint is entirely *presenter-oriented*, and *not content-oriented*, *not audience-oriented*. The claims of PP marketing are addressed to speakers" (p. 4). Among the charges he levies are the software's "conspicuous decoration and Phluff" and "a preoccupation with format not content."

Tufte's continued attacks on the new medium are not entirely without merit. If nothing else, they represent the attempts of one of the world's pre-eminent communication scholars to call for a time-out and to get us to carefully evaluate the credentials of this new kid on the communication block. Tufte's allegations should give pause to scholars in fields like communication and education, prompting us to recognize the need to investigate the effects that products like PowerPoint might have on the learning process.

Indeed, presentation software has become so pervasive that to ignore it, write it off, or, for that matter, to embrace it unequivocally, are all actions that are equally irresponsible from the standpoint of scholarship. Olaniran, Stalcup, and Jensen (2000)

have framed the situation in its proper perspective, despite the fact that few in the discipline appear to be listening:

> Just as traditional teaching methodologies must be evaluated and tested, selecting appropriate technologies is a critical part of its effective use in the classroom. One temptation is to rush in and adopt any technology. However, we suggest carefully considering technology as a tool to enhance learning. Technologies must accommodate pedagogy, not the reverse. (p. 1)

Communication scholars must be as concerned with assessing the effects of multimedia presentation software as they have been (and are) with the effects of such varied phenomena as television (cf. Hart, 1994; McLuhan, 1964 & 1967; Postman, 1985), film (Staiger, 1992 & 2000), art and architecture (Mumford, 1952), lying and deception (Ekman, 1985; Knapp, in preparation), the Internet (Kraut et al., 1998), postmodernism (Baudrillard, 1983), and machines (Brummett, 1999)—to name only a few. As is often the case with any tool, from fire to genetic engineering, its faults (such as they are) typically lay not with the tool itself, but in the way it is used. "It's not the product. It's the user," declared the *Houston Chronicle* in a direct reference to PowerPoint (Barlow, 2000). As Cassius told his interlocutor in *Julius Caesar*: "The fault, dear Brutus, is not in our stars, / But in ourselves" (1.2.149-150).

Having set up this quandary, we must now ask the obvious question: what are the communicative effects of PowerPoint? The most accurate answer is, unfortunately, that we don't know. As we saw in Chapter 1, precious little research has been done in this area (Szabo & Hastings, 2000). This project modestly attempts to begin remedying this situation by assessing what effect, if any, two of PowerPoint's many variables have on the learning process. Two sets of variables—font style and color contrast—will be discussed at length in the next chapter.

In place of any substantive quantitative evidence, what we do have is a wealth of anecdotal, qualitative evidence on both sides of the PowerPoint debate—tips, tricks, and

tirades. Nevertheless, these entries hail primarily from the popular press rather than the academy. As we indicated in Chapter 1, the lack of scholarly attention given to PowerPoint is most noticeable in the one discipline where intellectual curiosity about its effects would theoretically be greatest—Communication Studies. For example, a June 2003 search of the ComAbstracts database (titles and abstracts of almost sixty communication journals) turned up only two hits for the term *PowerPoint*—the Downing and Garmon (2001) article discussed in Chapter 1 and a distance-learning article by Carrell and Menzel (2001).

Still, Downing and Garmon's treatment groups *both* used PowerPoint, with the difference that one received hands-on training while the other followed a user's guide on their own. Furthermore, their focus was on the impact of this difference on students' confidence levels, rather than on learning. Hence, their data does not speak to the central question posed here of what effects, if any, the manipulation of PowerPoint itself has on comprehension.

Carrell and Menzel's (2001) results, on the other hand, may be of more use. They divided 120 undergraduate students into three treatment groups—a live classroom, a video classroom, and an audio-plus-PowerPoint classroom. Among other things, they found that actual short term learning varied significantly across the three settings and was highest in the PowerPoint classroom (even though *perceived* learning was higher in the live setting).

Outside our own discipline, the number of individuals participating in the PowerPoint conversation is only marginally better. Siegle and Foster (2001), writing in the *Journal of Research on Technology in Education*, reported that anatomy and physiology students benefited more from using PowerPoint, some instructional software, and laptops than from a traditional paper-based curriculum.

Perhaps the most direct assault on the PowerPoint-learning question is the research of Bartsch and Cobern (2003). They begin by pointing to research by Cassady (1998), Perry and Perry (1998), and others, noting that these studies suggest that students *prefer* PowerPoint presentations to traditional overhead transparencies, but that the question of the effect of such presentations on student performance (learning) remains largely unanswered. They further note that the *complexity* of the PowerPoint presentation—i.e., whether it simply features text on a colored screen vs. including animation, graphics, and video—may play a role in whether more or less learning occurs. Here the authors point to a handful of studies that found that certain extraneous elements can apparently inhibit learning, be they irrelevant sound effects (Moreno and Mayer, 2000), unnecessary text (Garner and Gillingham, 1998), or unrelated pictures (Mayer, 2001). In terms of the classic encoder-decoder communication model, these elements may constitute a form of noise. As Mayer argues: "students tend to learn more when less is presented" (p. 132).

Bartsch and Cobern (2003) therefore set about to assess whether using PowerPoint slides (of varying complexity) for lecturing would significantly affect satisfaction and/or actual learning as compared to using transparencies. They used "basic" PowerPoint presentations (text and color only) and "expanded" slides (pictures, sounds, graphs, and build effects for text). Some of their key findings included:

1. Students *believed* they learned more from PowerPoint-based lectures than from transparency-based lectures
2. Students performed approximately 10% worse on quizzes that were based on expanded PowerPoint lectures—significantly different from the basic PowerPoint presentation results, suggesting that PowerPoint's "bells and whistles" may be pedagogically counterproductive. In addition, the

expanded PowerPoint slides took 50% longer to prepare than the basic version.

3. Though there was a significant difference in learning between the basic and expanded PowerPoint slides, there was no significant difference between the transparency and PowerPoint methods in general

Yet earlier research by Szabo and Hastings (2000) (in life sciences) and Rankin and Hoass (2001) (in economics) was somewhat less conclusive on some of these same points, suggesting that there is more work to be done and that there may be any number of complex variables influencing the way multimedia presentations affect student learning.

POWERPOINT BY DESIGN

One way to address these variables is to recognize that, as we have suggested, PowerPoint itself is myriad in this regard. Authors of PowerPoint slides face seemingly countless choices, from font size and style to build effects for bullets to the option to include video or encode Flash files. In fact, because we are dealing with a visual medium, it is fair to refer to these variables as design elements (cf. Sloboda, 2003).

It is from a designer's perspective that much of the popular press' conventional (read as "qualitative") wisdom about how to communicate more effectively with PowerPoint (or without, as the case may be) has sprung. This approach is typical of many of PowerPoint's critics (e.g., Burge, 2003; McMaster, 2002; Schrage, 2003) and advocates alike (cf. Bird, 2001; Lowe, 2001; Marcovitz, 2001 Sloboda, 2003)—most of whom are neither wholly enamored of nor adamantly opposed to the software's use. Many, in fact, take a "tough love" approach and seem to be criticizing PowerPoint (i.e., its users) in order to save its reputation (e.g., Neuborne, 2003; Simons, 2002). As Manes

(1999) puts it: "PowerPoint presentations are the power neckties of modern business—annoying, ugly, and useless, but sometimes necessary for survival" (p.132). Gray (2002) called it "the most misused technological innovation since the handgun" (p. C1).

Even more than the popular press, the World Wide Web is replete with "experts" in matters of visual design, arguing for or against, among other things, the use of certain fonts on screen and in presentations (cf. Endter, 1997; Ivey, 1997; Wilson, 2001; Kenny, 2003). A Google search on June 15, 2003 for "PowerPoint tips and tricks," for example, yielded a list of 520 Web sites. However, in terms of citing solid research to support their positions, these sites typically offer little more than the suspect default line: "studies have shown that… ."

Unfortunately, the discipline's textbooks stand, for the most part, on the same empirically shaky ground. For example, the most popular text in the business communication curriculum at The University of Texas at Austin, the largest university in the U.S., is Guffey's *Business Communication: Process and Product* (2003).[8] Business speakers use PowerPoint, Guffey argues, "because it increases audience enjoyment, comprehension, and retention," but she fails to cite any research to support this conclusion. She then turns to design issues as the key to PowerPoint's effectiveness: "You must learn about using templates, working with color, building bullet points, and adding multimedia effects" (p. 500). Yet what follows is basically a "how-to" rather than a "why it matters" discussion. She does cite two "experts," but both sources turn out to be two-page "tips & tricks" articles by business writers for *Presentations* magazine (Endicott, 1998; Rotondo, 2001). All-told, the preferred business communication basic course title at the largest university in the United States devotes less than 1% of its pages to understanding what may be the most widely-used (and misused) visual aid in history.

[8] The author has been an instructor in this program since September, 2002.

Other current communication texts tell a similar tale. Prentice Hall's primary business communication offering is Bovée, Thill, and Schatzman's *Business Communication Today* (2003). As with Guffey, the authors emphasize the paramount importance of design when using computers to create visuals. They do, however, make a general claim about learning, though the source for the citation is the Web site of the 3M Meeting Network (who would seem to have a vested interest in such outcomes since they make projectors and whiteboards): "Studies of behavioral research have shown that visual aids can improve learning by up to 400 percent because humans can process visuals 60,000 times faster than text" (p. 517).

Elsewhere in the text, a picture caption claims that "an effective presentation can significantly boost the retention level of audience members" (p. 518), but provides no reference. A similarly suspect discussion of the impact of color suggests that its use can boost learning and retention by more than 75 percent. As before, however, the source for this data is the 3M Meeting Network.

Stephen Lucas' *The Art of Public Speaking* (2001) is a longtime bestseller for McGraw-Hill. The book is aimed at a general speech communication audience as opposed to the preceding two titles that specifically target the business communication niche. Lucas does cite a handful of social scientific research—most of it reported in the *Journal of Educational Psychology*—in support of his general contention that visual aids: a) promote clarity, b) generate interest, c) enhance retention, and d) increase persuasiveness.

Nevertheless, such elements are not necessarily related to *learning*, which is the question being asked by the present project. Lucas devotes just over one page to multimedia presentations as a VA category, though he invites readers to view a basic "how-to" PowerPoint tutorial on the supplemental CD-ROM that accompanies the text.

Like much of the material currently in circulation, Lucas' tutorial relies on a common-sense approach to reinforce a handful of design principles, none of which appear to have been verified through quantitative testing. His design elements include color, fonts, font sizes, clipart/photos, and animations.

TRUE CONFESSIONS

To be fair, the author of this proposal bears some responsibility for this seat-of-the-pants approach to the teaching effectiveness of presentation software. In 2001, when McGraw-Hill was updating several of their communication titles, the company asked me to write a PowerPoint tutorial to replace the Lucas tutorial in several textbooks that were written by other authors; *PowerPoint: The Rules of Design* was the result. In it, I proposed a set of common-sense design principles governing everything from template selection to the maximum number of words a slide should have (Earnest, 2001).

But like many of the efforts to date, the *Rules of Design* were arrived at through intuition rather than rigorous testing. These design rules seemed logical and would presumably promote more effective communication (and hence improved comprehension), but from the standpoint of social science, they were (and are) nothing more than hypotheses.

The time has come, then, to begin testing such hypotheses. As we have seen (and will continue to see in the next chapter), precious little is actually known about what effects, if any, variables like presentation design have on an audience's ability to learn. The experiment described in the next chapter represents only the first few steps on what is surely one of the most worthwhile roads that praxis-oriented disciplines like ours can explore. We may find that our intuitions about the rules of design were correct all along

and that all's well that ends well. On the other hand, we may find that it has all been much ado about nothing. Either way, we will be the better for the knowing.

Chapter 5:
Methods and Procedures

"When the text is crudely rendered, the eye goes looking for distraction, which the screen is all too able to provide."

— Robert Bringhurst, *The Elements of Typographic Style*

THE PRESENT EXPERIMENT

So that the terrain of the current project is clearly defined, it is important to note that there are at least three distinct communication settings where questions about the effects of design on audience comprehension are salient. These three milieus are the printed page (*print* mode), the personal computer (*PC* or *desktop* mode), and the projected screen (*classroom* or *lecture* mode).

Each of these three settings create widely-varying viewing environments for audiences. It would be unwise, therefore, to assume that the comprehension-enhancing design principles of one medium translate "as is" into another. And while it seems logical (even a truism) that using visual aids such as slides can enhance a speaker's persuasiveness, as Malkewitz, Wright, and Friestad (2003) concluded after surveying the field of visual persuasion, practical expertise in such matters remains relatively undeveloped. We can intuit many things, but the mechanics of how visual persuasion impacts the classroom learning process remains largely unexplored from a quantitative standpoint.

To be fair, some scholarly attention has been paid to the effects of design in the print and PC modes (e.g., Boyarski, Neuwirth, Forlizzi, & Regli, 1998; Mills & Weldon, 1987; Weisenmiller, 1999; Wheildon, 1995). What has not been adequately addressed,

however, is whether variation in design can significantly effect learning in classroom/lecture settings. Any research that sheds light on this subject meets a pressing academic need.

The conclusions of the PC studies are nevertheless a useful starting point for setting the parameters of classroom-focused research. In other words, because both are *screens* (albeit projection vs. desktop), I began by theorizing that many of the rules that apply to the PC mode may be valid for classroom settings vis-à-vis their shared screen-like characteristics. The literature that will be reviewed here suggested two starting points for considering how screen design might impact classroom learning—*font style* (serif vs. sans serif) and *contrast level* (high vs. medium).

Studies such as the ones cited above seem to indicate that improved learning (as measured by tests of comprehension) occurs when sans serif fonts are used in place of serif fonts on the PC screen. Moreover, in terms of measures such as the readability of type, results from several PC studies suggested that the sans serif fonts Verdana and Arial are more readable on-screen than their serif counterparts (such as the ubiquitous Times New Roman). For example, an informal online survey conducted by Wilson (2001) found that, at point sizes of 10 and smaller, Verdana was considered more readable on a PC screen than other fonts.[9]

On the basis of this type of preliminary evidence, I elected to use Verdana as the sans serif font of choice in this study. Both Verdana and Times New Roman (the serif representative) were ecologically valid choices for this design as they are widely distributed fonts that are frequently used in electronic publishing (Mantex, 1999).

On the question of contrast, Wheildon's (1995) research on printed material found that reader comprehension was significantly greater when black text was used on white

[9] To be fair, this finding may be of little practical value; 10-point font sizes would seem to be the exception rather than the rule when it comes to the way the majority of text is displayed on a monitor.

paper. Kroodsma and Byers (2000), citing research by Smith (1957) and Toft (1998), recommended the "fail-safe" approach (to guard against lighting conditions that can vary by venue) of using dark lettering against an off-white background. For this reason, the high-contrast slideshows in the present experiment used black text against an almond (off-white, effectively) background. Furthermore, I controlled for the potentially deleterious effects of variations in lighting conditions from group to group by scheduling all experimental sessions in the same windowless room and using the same audiovisual equipment.

Mills and Weldon (1987) found a variety of relatively uncoordinated research on the subjects of color and contrast but seem to suggest that what matters most on computer screens is that there *be* contrast—i.e., the higher the contrast (whether dark text on a light field or vice versa), the better the viewing experience since "dark characters on dark backgrounds and light characters on light backgrounds have low luminous contrast and are not very legible" (p. 344). The use of white text on a medium blue background, therefore, became our choice for the two medium-contrast control groups. This color scheme seemed an acceptable way to test the contrast issue without going to impractical or unrealistic extremes (e.g., dark gray text on a black field).

I assume that I could have increased the chances of getting statistically significant results by testing high contrast slides against low contrast slides, but since the latter condition is so *obviously* difficult to read, I proceeded from the assumption that its real-world use is relatively limited. In practice, the real problem—and the one I sought to recreate—does not seem to be high contrast vs. low contrast, but high contrast vs. less-than-maximal (i.e., "medium") contrast.

The assumption that medium contrast is a greater concern than low contrast appears to be borne out by the results obtained in response to a request for representative

samples of lectures slides that I posted on the Communication Research and Theory Network (CRTNET) Internet list-serv on April 8, 2003. A facsimile copy of this email is reprinted as Appendix A. The request was answered with the submission of 46 slideshows by 22 individual instructors from around the U.S. Roughly 17% of these slideshows (representing 27% of the instructors) contained slides that made considerable use of medium contrast color schemes. Conversely, only two (c. 4%) of the slideshows surveyed exhibited low-contrast characteristics, a finding that seemed to confirm my underlying suspicion that low contrast slide use is hardly epidemic in scope.

The experimental design described below was created to test variations of the two chosen design elements of font style and contrast level by positing them as independent variables against the dependent variable of learning as well as an additional general satisfaction measure.

DESIGN

The experiment used a design with a participant pool of 138 subjects (ranging from 23 to 32 per group) who watched and listened to a speaker give a short speech on a topic of general interest—the historical relationship of Texas institutions to the high-tech industry. In four of the five treatment groups, the speaker's presentation was accompanied by a set of PowerPoint slides, each of which contained variations of the two design elements of font style and level of contrast. Members of the fifth control group watched the speaker give the same speech as the other groups, but without the aid of an accompanying slideshow. Table 5-1 summarizes what each group of participants was shown.

Table 5-1 – Design variables by treatment group

Group	(N)	Font style / contrast level	Font selection / color scheme
1	23	sans serif / high contrast	Verdana / black text, almond background
2	25	serif / medium contrast	Times / white text, medium blue background
3	32	sans serif / medium contrast	Verdana / white text, medium blue background
4	30	serif / high contrast	Times / black text, almond background
5	28	---	(Speaker only – no slides)

The actual *content* of the slides was identical across all groups (1 through 4) and featured the same spatial arrangement. With the exception of type style and contrast level, the remaining design elements were rendered consistently among all four slideshow variants, including using the default PowerPoint sizes of 44 points for slide titles and 32 points for main bullets. This parameter is consistent with research reported by Kroodsma and Byers (n.d.), who surveyed attendees at the 1999 meeting of the American Ornithologists' Union and found that 99% preferred lower case type sizes of at least $1/25^{th}$ the height of a given slide. Based on this finding, they recommend sizing characters at a minimum of $1/20^{th}$ the height of the slide. For PowerPoint, specifically, this standard translates to a minimum character size of approximately 30 points.

Finally, the slides featured no other variables, such as sound effects or clip-art, that could have potentially influenced the way the audience processed the information presented (Moreno & Mayer, 2000). As Table 5-1 indicates, the only differences among the slideshows lay in the choice of font and color scheme.

In order to ensure that the speaker performed consistently from group to group, I videotaped each session, captured the same 40-second portion of the speech from the tape, and compiled them sequentially onto a separate tape. Then two colleagues and I

independently viewed the clip tape and rated the speaker's overall consistency. The following instrument was used to obtain this measure:

1. In general, how consistent was the speaker's delivery from clip to clip?

1	2	3	4	5	6	7	8	9	10
Not at all consistent									**Extremely consistent**

2. The excerpts I viewed appeared fairly uniform in relation to one another (excluding variations in lighting, etc.).

1	2	3	4	5	6	7	8	9	10
Strongly disagree									**Strongly agree**

All three evaluators rated the speaker at 9 or above, satisfying the concern that a live speaker could theoretically deliver the same material in different styles to different groups and therefore potentially negate any effects attributable to the variables under study.

Videotaping the speaker and showing control audiences his tape on one screen and the slides on an adjoining screen was another option that was considered. While this approach would have ensured perfect speaker reliability, it would have been ecologically invalid as very little classroom learning occurs in this manner (with the possible exception of distance learning). The goal instead was to accurately recreate the "typical" classroom lecture where slides are used to augment a speaker's oral message.

Moreover, because of the increasing prevalence of slides in the college classroom, I felt it important to directly interrogate the relationship of slides to *learning*. As we have seen, existing studies have tended to focus more on the aesthetic impact of screen design

elements. While research into factors like readability and legibility are not without merit, in the end they may have very little to do with what for us as educators is the bottom-line: the learning process. Even the massive research that has been conducted over the years into how people learn, while useful, misses the more immediate concern of whether or not slide design affects learning. In other words, the proof is in the pudding—the exact mechanisms by which slides may or may not affect *how* audiences learn are immaterial; what is material in the current investigation is whether, given variation in slide design, the level of learning that occurs is affected at all. It was with this purpose in mind, therefore, that the hypotheses described in the next section were articulated.

HYPOTHESES

By manipulating the speaker's accompanying slides vis-à-vis the possible combinations of font style and contrast level, I offered the following hypotheses about the relationship of slide design to audience learning and overall satisfaction. In this design, short term learning and overall satisfaction would be measured immediately after the conclusion of the presentation and long term learning would be assessed one week to ten days later:

> H1: **Short term** learning is **greater** when a lecture is accompanied by PowerPoint **slides** than when **no slides** are used.
>
> H1a: **Long term** learning is **greater** when a lecture is accompanied by PowerPoint **slides** than when **no slides** are used.
>
> H2: **Short term** learning is **greater** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** rather than **Times New Roman**.
>
> H2a: **Long term** learning is **greater** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** rather than **Times New Roman**.

H2b: **Overall satisfaction** with the learning process is **greater** when a lecture is accompanied by PowerPoint slides rendered in **Verdana** rather than **Times New Roman**.

H3: **Short term** learning is **greater** when a lecture is accompanied by PowerPoint slides displayed in **high contrast** rather than **medium contrast** colors.

H3a: **Long term** learning is **greater** when a lecture is accompanied by PowerPoint slides displayed in **high contrast** rather than **medium contrast** colors.

H3b: **Overall satisfaction** with the learning process is **greater** when a lecture is accompanied by PowerPoint slides displayed in **high contrast** rather than **medium contrast** colors.

H4: **Short term** learning is **greatest** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** and displayed in **high contrast** colors than under **any other combination** of font and color scheme.

H4a: **Long term** learning is **greatest** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** and displayed in **high contrast** colors than under **any other combination** of font and color scheme.

H4b: **Overall satisfaction** with the learning process is **greatest** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** and displayed in **high contrast** colors than under **any other combination** of font and color scheme.

H5: **Short term** learning is **weakest** when a lecture is accompanied by PowerPoint slides rendered in the font **Times New Roman** and displayed in **medium contrast** colors than under **any other combination** of font and color scheme.

H5a: **Long term** learning is **weakest** when a lecture is accompanied by PowerPoint slides rendered in the font **Times New Roman** and displayed in **medium contrast** colors than under **any other combination** of font and color scheme.

H5b: **Overall satisfaction** with the learning process is **weakest** when a lecture is accompanied by PowerPoint slides rendered in the font **Times New Roman** and displayed in **medium contrast** colors than under **any other combination** of font and color scheme.

STIMULUS MATERIALS

The lecture used in the experiment was an adaptation of a speech by University of Texas at Austin President Larry Faulkner—"Technology, the University, and the Transformation of Texas"—originally delivered at an Austin symposium on March 6, 1998, roughly a month before his installation as the institution's president. It was not deemed necessary to obtain permission to use this speech since, like similar orations by other government officials, it is considered public domain. The original speech is readily accessible and appears without copyright notice on the UT President's Office Web site at http://www.utexas.edu/president/.

We chose this particular speech for two reasons: a) because of its general relevance to the audience (i.e., the State of Texas and UT-Austin as opposed to, for example, interests in Rhode Island), and b) because of its relatively non-controversial subject matter (i.e., technology and economic development versus, for example, abortion or gay marriage). The text of the original version of the speech is reprinted in Appendix B, while Appendix C contains the script of the final, modified version as delivered by the speaker (and which contained cues designed to help him practice coordinating the timing of his oral material with the corresponding slide bullets).

During each of the five delivered iterations of the speech, the slide bullets were cued by a proctor (the author) to "build" synchronously with the speaker as he addressed each bulleted point in turn. The bullets on the accompanying slides were keyword (as opposed to verbatim) summaries of the speech's text as might be commonly done in any classroom setting where a lecturer is speaking extempore with the aid of slides. Full-color miniatures of the four slideshow versions are reproduced in Appendix D.

As a quality control measure, approximately one week prior to the initial data gathering sessions, the author, dissertation adviser, and the designated speaker met in the

very room the participants would be using in order to do a walkthrough of the presentation and resolve any outstanding technical or operational issues. This meeting did in fact bring several concerns to light that were addressed and incorporated into the final experimental design as described in this chapter.

SUBJECTS

Participants were BA 324 (Business Communication) undergraduates at The University of Texas at Austin during the Fall 2003 semester. Participation in the study was voluntary and course instructors offered extra credit to those who took part in the study. In no case was participating in this study a student's only opportunity to earn extra course credit. The overt purpose of the study was not explained to participants in order to avoid the potential for affecting the objectivity and accuracy of their participation.

These BA 324 students were pupils of two teachers. One instructor regularly used PowerPoint for classroom lectures while the other one used such software less frequently. Regardless, it is fair to assume that these students, the majority of whom were sophomores, had been frequently exposed to PowerPoint classroom lectures in other courses taken at the business school and throughout the university. Therefore, as a test population, they were fairly uniform.

The privacy of participating students was enhanced by carefully designing the experiment so that first name and last initial (e.g., David M.) were the only personally identifiable data contained on any of the physical or electronic documents produced in this research. Application was made to the university's Institutional Review Board (IRB) to obtain permission for human subject testing. The IRB proposal was approved for the period of October 9, 2003 to October 9, 2004 and given an internal control number of

2003-08-0065. The IRB approval also included a complete waiver of informed consent requirements due to the non-invasive, generalized nature of the research.

PROCEDURES

Each of the five experimental sessions began by having the proctor (the author) hand students a set of preliminary written instructions as they filed into their classroom (the room used in the experiment was the regular classroom used by all five BA 324 sections). A copy of these preliminary instructions appears in Appendix E.

Once the room had gathered, the proctor very briefly thanked participants for making use of the extra credit opportunity and reiterated a couple of key items from the written instruction sheet (e.g., the importance of giving the speaker their undivided attention and to refrain from taking notes). The proctor then moved to the back of the room to operate the video camera and remote mouse during the speaker's presentation. The modified speech was delivered in a conversational style by a graduate student in the Communication Studies department at UT-Austin. To help keep speaker effects to a minimum by promoting a more consistent and uniform performance, the presenter refrained from gesturing and offered only limited eye contact each time he gave the speech. At the conclusion of every instantiation of the speech, the presenter exited the room without any comment or fanfare except for the audience's polite applause.

The proctor then: a) asked participants to answer a few questions about the presentation, b) asked them to carefully read the instructions on the test form, and c) distributed the tests. The subjects were also reminded that even though their answers would not be graded, it was very important that every question be answered and done so as accurately as possible. Appendix F shows the satisfaction/short term questionnaire used for Groups 1 through 4.

The possibility existed that participants could correctly answer some of the short term questions on the basis of general knowledge rather than from information learned in the context of the experimental presentation. To guard against this pitfall, the short term questionnaire was administered to two test groups—6 and 7—prior to the running the full experiment with Groups 1 – 5 (total N=199). These two test groups received only the short term test—absent speaker and slides. Administering the test completely out of context and without explanation (other than to explain that it was an extra credit opportunity) to the test groups made it would be possible to use a Chi-Square analysis to compare their question-by-question scores with those of the five control groups. If a given question were truly context-dependent (as expected), Groups 6 and 7 would score significantly lower on it than Groups 1 – 5. All nine questions were analyzed in this way and the results are reported in Table 5-2. In each case, the scores of the five treatment groups were significantly higher than those of the two test groups; all questions, therefore, were presumed valid as potential measures of context-dependent learning.

Table 5-2 – Individual question analysis (control groups vs. test groups)

Question	Chi-Square Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
1	51.620 (a)	1	.000000000000674	.00000000000106	.00000000000088
2	70.421 (b)	1	.00000000000000005	.00000000000000371	.00000000000000002
3	72.140 (c)	1	.00000000000000002	.00000000000000053	.00000000000000002
4	62.965 (d)	1	.00000000000000210	.00000000000001205	.00000000000000239
5	15.884 (e)	1	.0000673	.0000519	.0000294
6	38.133 (f)	1	.000000000661	.000000002405	.000000002332
7	80.897 (g)	1	.00000000000000000	.00000000000000000	.00000000000000000
8	37.763 (h)	1	.000000000799	.000000001442	.000000001236
9	7.568 (i)	1	.00594	.00696	.00505

(a) 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.30.
(b) 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.14.
(c) 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.38.
(d) 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.99.
(e) 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.01.
(f) 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.25.
(g) 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.73.
(h) 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.68.
(i) 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.38.

Separate from the nine short term learning questions, the satisfaction measure was intended to gauge the more subjective question of whether audiences aesthetically preferred serif over sans serif fonts and/or high contrast colors more than medium contrast color schemes. The three satisfaction questions used a Likert-style scale with answers ranging from 1 (strongly agree) to 7 (strongly disagree); the nine short term learning questions used an objective-style, multiple choice format. The three satisfaction questions preceded the short term learning items to avoid the possibility that emotions stemming from the test-taking experience might unduly influence subjects' feelings about the slides and the learning experience. Because Group 5 viewed the presentation without the aid of slides, the satisfaction measures (the first three questions on Appendix F) were omitted from the questionnaire for that group.

A sufficient amount of time was provided for all participants to comfortably answer the questions before the instruments were collected. After the proctor had

collected the questionnaires, participants were thanked once again and reminded that to receive the available extra credit for the assignment they would need to complete the second, online portion of the project. Before leaving, the proctor informed the audience that they would receive written or electronic instructions for completing the second part in approximately one week to ten days. Nine days later, all participants were sent an email by the proctor giving them instructions for completing the second, online portion of the assignment. The text of this email is presented in Appendix G.

The instructional email urged participants to complete the online survey immediately if possible. To allow, however, for the vagaries of electronic communication (e.g., students' Hotmail accounts blocking emails sent from hosts such as the university server used by the author), some were sent reminders through other channels (e.g., the author's own Hotmail account) and all participants were given verbal reminders in class by their instructor. To accommodate these outliers, the deadline for completing the online survey was extended for several days. The survey was hosted on a commercial site called SurveyMonkey.com and used a unique Web address for each of the five treatment groups to prevent cross-pollination of answers. Because the addresses for these surveys are not likely to be active indefinitely, in lieu of a Web address, screen shots of a representative survey (that of Group 1) have been captured and reconstituted here as Appendix H.

The online instrument featured the same questions as appeared in the short term learning survey and were presented in the same order. The answers, however, were randomized for each participant. In addition to randomizing the answers, the SurveyMonkey service made it possible to use a one-question/one-screen design, to minimize the risk of questions being overlooked as might occur when a PC user must scroll through a long list of multiple items. Further, the site's software ensured that only

one answer could be selected per question (though changing an answer before proceeding was permissible) and that users could not advance to the next screen/question until the current question was completed.

The execution of the experimental sessions and the online follow-ups went according to plan and were conducted without incident. Table 5-3 shows the design matrix that I used to organize the collected data sets.

Table 5-3 – Data design

Characteristic	Group 1	Group 2	Group 3	Group 4	Group 5
Verdana	X		X		
Times New Roman		X		X	**No slides**
High contrast	X			X	
Med contrast		X	X		
Short term learning (ST)	$G1_{ST}$	$G2_{ST}$	$G3_{ST}$	$G4_{ST}$	$G5_{ST}$
Long term learning (LT)	$G1_{LT}$	$G2_{LT}$	$G3_{LT}$	$G4_{LT}$	$G5_{LT}$
Overall satisfaction (SAT)	$G1_{SAT}$	$G2_{SAT}$	$G3_{SAT}$	$G4_{SAT}$	---

Data sets (scores)

In the next chapter I present the results of my statistical analysis of these data.

Chapter 6:
Data Analysis

"Quantitative research has been hard to come by, and robbed of the benefits of empiricism, we are forced to rely on what we know instinctively to be right."

— Colin Wheildon, *Type & Layout*

RESULTS

Tests of differences were conducted on each hypothesis using either one-way analysis of variance (ANOVA) tests or non-parametric analyses like Mann-Whitney. Data from the five treatment groups were analyzed using SPSS v. 11.5 statistical software. The author was assisted in his analysis by Shanna Smith and Nancy Heger of the Academic Computing and Instructional Technology Services Help Desk at UT-Austin. Additional assistance was provided by Gail Gemberling of the university's Department of Management Science and Information Systems and Geoffrey Tumlin in the Communication Studies department.

Hypotheses H1 and H1a looked at whether the presence of slides of any kind significantly enhanced participants' comprehension (i.e., whether slides, regardless of their individual design characteristics, are always better than an unaided speaker):

> H1: **Short term** learning is **greater** when a lecture is accompanied by PowerPoint **slides** than when **no slides** are used.
>
> H1a: **Long term** learning is **greater** when a lecture is accompanied by PowerPoint **slides** than when **no slides** are used.

These hypotheses were tested simultaneously using a repeated-measures 5x2 ANOVA, with a five-level between-subject factor and a two-level within-subject factor. The results of this analysis are summarized presented in Tables 6-1 and 6-2.

Table 6-1 – Short term and long term learning scores (slides vs. no slides)

Groups	TIME	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
No slides	Short term	**5.200**	.327	4.553	5.847
	Long term	**4.900**	.365	4.177	5.623
Slides	Short term	**7.343**	.143	7.060	7.625
	Long term	**6.067**	.159	5.751	6.382

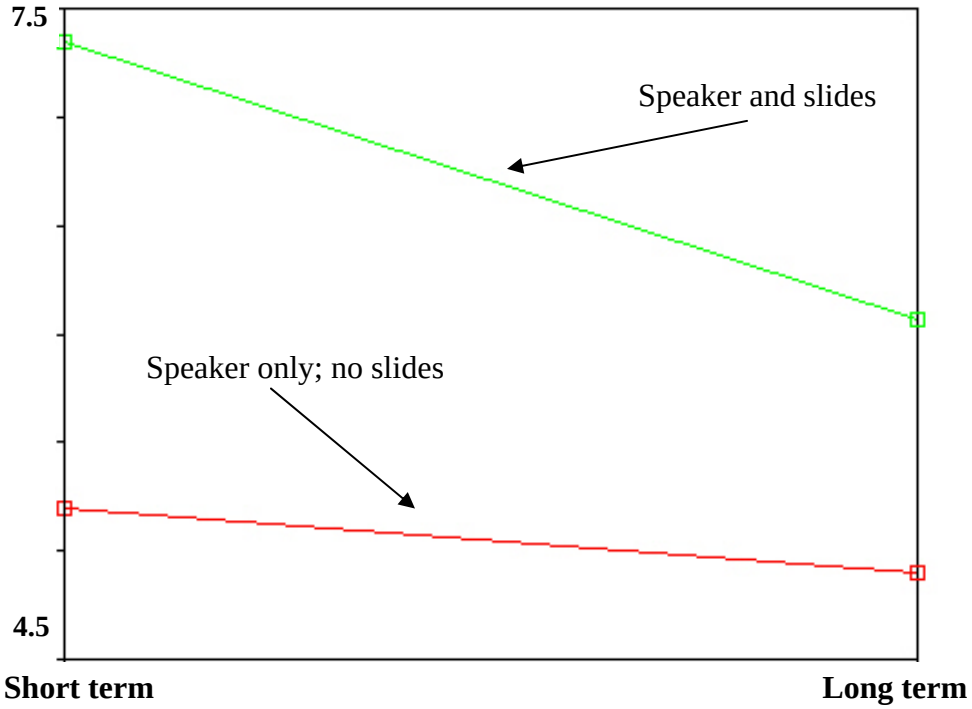
Table 6-2 – Significance of learning effects over time (slides vs. no slides)

Effect	Method	Value	F (exact)	Hypothesis df	Error df	Sig.
TIME * SLIDES	Pillai's Trace	.053	6.857	1.000	123.000	**.0099410**
	Wilks' Lambda	.947	6.857	1.000	123.000	**.0099410**
	Hotelling's Trace	.056	6.857	1.000	123.000	**.0099410**
	Roy's Largest Root	.056	6.857	1.000	123.000	**.0099410**

As these scores indicate, learning declined for all groups whether slides were present or not. In fact, this relative loss was actually more pronounced for the slide-based groups than for the group that did not have slides.

The drop in learning from short term to long term exhibited by the slide-based groups is, however, entirely in keeping with expectations. The statistical phenomenon of regression to the mean suggests that, over time, the scores would naturally be expected to grow closer together. Because the slide groups had scores that were so much higher to begin with, however, the burden of the change lay with them. In other words, the higher scores had nowhere to go but down. At the same time, members of the non-slide group, having started low, did not lose knowledge over time so much as they failed to acquire it in the first place. The change in scores over time is illustrated graphically in Figure 6-1. The maximum possible score was 9.0 (i.e., all nine questions correct).

Figure 6-1 – Comparison of short term and long term learning scores, speaker-only group vs. groups with speaker and slides



As a further check to confirm these results, I performed a separate, multivariate analysis on these data. The results of this five-level between-subject factor MANOVA with two dependent variables (short term and long term learning) are shown in Table 6-3 (mean learning scores), Table 6-4 (short term learning pairwise comparisons), and Table 6-5 (long term learning pairwise comparisons).

Table 6-3 – Learning scores by group (method: MANOVA)

GROUP	Learning category	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	Short term	**7.429**	.320	6.794	8.063
	Long term	**5.714**	.356	5.009	6.420
2	Short term	**7.115**	.288	6.545	7.685
	Long term	**5.923**	.320	5.289	6.557
3	Short term	**7.207**	.273	6.667	7.747
	Long term	**6.034**	.303	5.434	6.635
4	Short term	**7.621**	.273	7.081	8.160
	Long term	**6.483**	.303	5.882	7.083
5 (no slides)	Short term	**5.200**	.328	4.550	5.850
	Long term	**4.900**	.365	4.177	5.623

Table 6-4 – MANOVA pairwise comparisons (**short term** learning)

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference (a)	
					Lower Bound	Upper Bound
1	2	.313	.431	1.000	-.919	1.545
	3	.222	.421	1.000	-.981	1.425
	4	-.192	.421	1.000	-1.395	1.011
	5	2.229(*)	.459	**.0000360**	.917	3.540
2	1	-.313	.431	1.000	-1.545	.919
	3	-.092	.396	1.000	-1.225	1.042
	4	-.505	.396	1.000	-1.639	.629
	5	1.915(*)	.437	**.0002484**	.667	3.164
3	1	-.222	.421	1.000	-1.425	.981
	2	.092	.396	1.000	-1.042	1.225
	4	-.414	.386	1.000	-1.516	.689
	5	2.007(*)	.427	**.0000689**	.787	3.227
4	1	.192	.421	1.000	-1.011	1.395
	2	.505	.396	1.000	-.629	1.639
	3	.414	.386	1.000	-.689	1.516
	5	2.421(*)	.427	**.0000009**	1.200	3.641
5	1	-2.229(*)	.459	.000	-3.540	-.917
	2	-1.915(*)	.437	.000	-3.164	-.667
	3	-2.007(*)	.427	.000	-3.227	-.787
	4	-2.421(*)	.427	**.0000009**	-3.641	-1.200

(*) The mean difference is significant at the .05 level.
(a) Adjustment for multiple comparisons: Bonferroni

Table 6-5 – MANOVA pairwise comparisons (**long term** learning)

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference (a)	
					Lower Bound	Upper Bound
1	2	-.209	.479	1.000	-1.579	1.162
	3	-.320	.468	1.000	-1.659	1.018
	4	-.768	.468	1.000	-2.107	.570
	5	.814	.510	1.000	-.645	2.274
2	1	.209	.479	1.000	-1.162	1.579
	3	-.111	.441	1.000	-1.373	1.150
	4	-.560	.441	1.000	-1.821	.702
	5	1.023	.486	**.373**	-.366	2.412
3	1	.320	.468	1.000	-1.018	1.659
	2	.111	.441	1.000	-1.150	1.373
	4	-.448	.429	1.000	-1.675	.778
	5	1.134	.475	**.184**	-.223	2.492
4	1	.768	.468	1.000	-.570	2.107
	2	.560	.441	1.000	-.702	1.821
	3	.448	.429	1.000	-.778	1.675
	5	1.583(*)	.475	**.011**	.225	2.940
5	1	-.814	.510	1.000	-2.274	.645
	2	-1.023	.486	.373	-2.412	.366
	3	-1.134	.475	.184	-2.492	.223
	4	-1.583(*)	.475	.011	-2.940	-.225

(*) The mean difference is significant at the .05 level.
(a) Adjustment for multiple comparisons: Bonferroni

The results of this MANOVA were consistent with those of the repeated-measures analysis. With regard to long term learning, however, the multivariate analysis showed that, as a result of regression to the mean, only Group 4 (high contrast, Times New Roman) scored significantly better than the group with no slides (ρ=0.011).

More narrow in focus than H1 and H1a, Hypothesis H2 sought to measure the effect, if any, on short term and long term learning of using slides featuring the sans serif font Verdana vs. the serif Times New Roman:

> H2: **Short term** learning is **greater** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** rather than **Times New Roman**.
>
> H2a: **Long term** learning is **greater** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** rather than **Times New Roman**.

Separate one-way ANOVAs were performed that pitted the sans serif Verdana groups (1 and 3) against the serif Times New Roman groups (2 and 4), first for short term learning and then for long term learning. The results for the short term analysis are presented in Table 6-6, and clearly show that, at ρ=0.549, there was no discernable difference in immediate learning associated with the use of one type of font over another. Hence there was no empirical support for Hypothesis H2.

Table 6-6 – Effects of font style on short term learning

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.742(a)	1	.742	.361	**.549**
Intercept	5986.299	1	5986.299	2911.872	.000
Type of Font	.742	1	.742	.361	**.549**
Error	228.197	111	2.056		
Total	6223.000	113			
Corrected Total	228.938	112			

(a) R Squared = .003 (Adjusted R Squared = -.006)

The long term learning results told a similar tale, as shown in Table 6-7. With a ρ-value of 0.336, no scientific claim can be made that long term learning is either positively or negatively affected by a speaker's choice of Verdana or Times New Roman.

Table 6-7 – Effects of font style on long term learning

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.652(a)	1	2.652	.936	**.336**
Intercept	3846.080	1	3846.080	1357.215	.000
Type of Font	2.652	1	2.652	.936	**.336**
Error	291.882	103	2.834		
Total	4159.000	105			
Corrected Total	294.533	104			

(a) R Squared = .009 (Adjusted R Squared = -.001)

To investigate these results further, I measured the observed power of the short term learning effects and found, as Table 6-8 shows, that even if the study had been conducted with a much larger sample population, the results would still not have been significant.

Table 6-8 – Observed power of short term learning effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power (a)
Corrected Model	.742(b)	1	.742	.361	.549	**.003**	.361	**.091**
Intercept	5986.299	1	5986.299	2911.872	.000	.963	2911.872	1.000
Type of Font	.742	1	.742	.361	.549	**.003**	.361	**.091**
Error	228.197	111	2.056					
Total	6223.000	113						
Corrected Total	228.938	112						

(a) Computed using alpha = .05
(b) R Squared = .003 (Adjusted R Squared = -.006)

Not only did the data *not* support Hypotheses H2 and H2a, the serif Times New Roman groups actually scored slightly *better* on the short term learning test than the sans serif Verdana groups (7.36 vs. 7.20 out of a possible 9.0), as shown in Table 6-9. This finding, though not significant, was nevertheless counter to expectations.

Table 6-9 – Mean short term learning scores by font style

Variable	Font	N	Mean	Std. Deviation	Std. Error Mean
SHTERM	Verdana	55	**7.20**	1.445	.195
	Times New Roman	58	**7.36**	1.423	.187

Hypothesis H2b was the first of several hypotheses that sought to gauge the more subjective measure of audience *satisfaction* with the presentation. H2b dealt specifically with the possible relationship between satisfaction and font style.

H2b: **Overall satisfaction** with the learning process is **greater** when a lecture is accompanied by PowerPoint slides rendered in **Verdana** rather than **Times New Roman**.

Because this measure is specifically concerned with reaction to a set of slides, Group 5 (the group with no slides) received a version of the short term questionnaire that omitted these items. Recalling Appendix F, the three questions posed to members of Groups 1 through 4 were as follows:

1. The slides in this presentation were easy to read.
2. The colors used on these slides were pleasant to look at.
3. The slides helped me follow what the speaker was saying.

For each question, respondents were asked to choose one answer on a discrete continuum from 1 (strongly agree) through 7 (strongly disagree). Because these questions deal with personal opinion and are therefore potentially very subjective in nature, I used a non-parametric form of data analysis rather than a univariate ANOVA. The Mann-Whitney rank sum test is particularly useful when data does not follow a normal distribution, such as the kind of preferential ranking under consideration here. Figures 6-2, 6-3, and 6-4 show that the data for each of these three satisfaction questions was skewed enough to render moot the need for parametric analyses such as ANOVA.

Figure 6-2 – Distribution of data for "**slides were easy to read**"

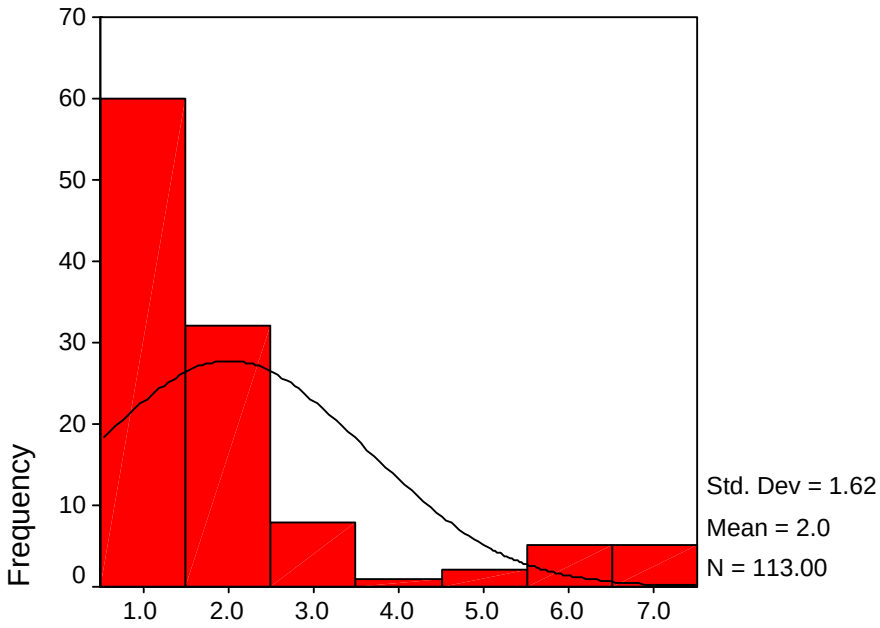


Figure 6-3 – Distribution of data for "**colors were pleasant to look at**"

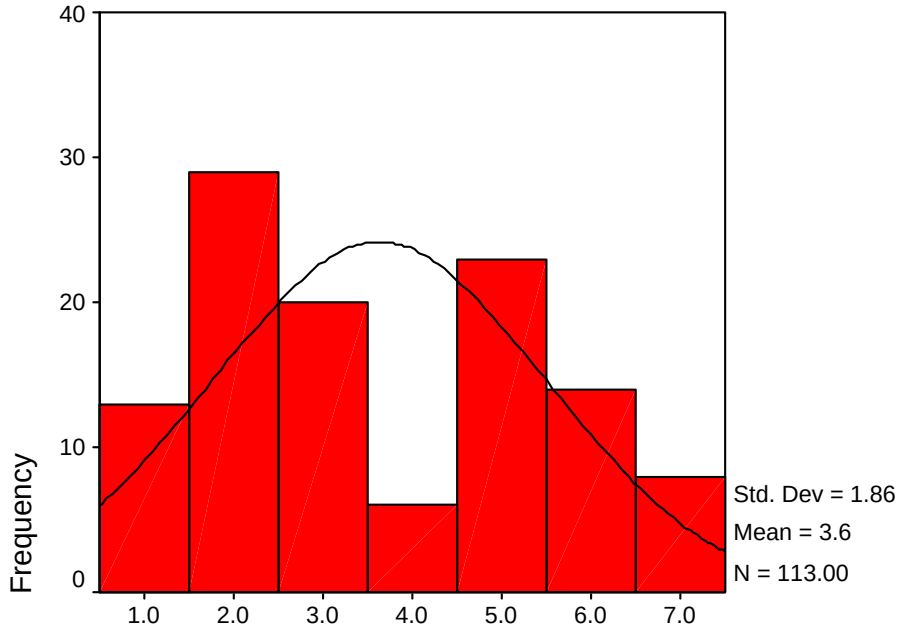
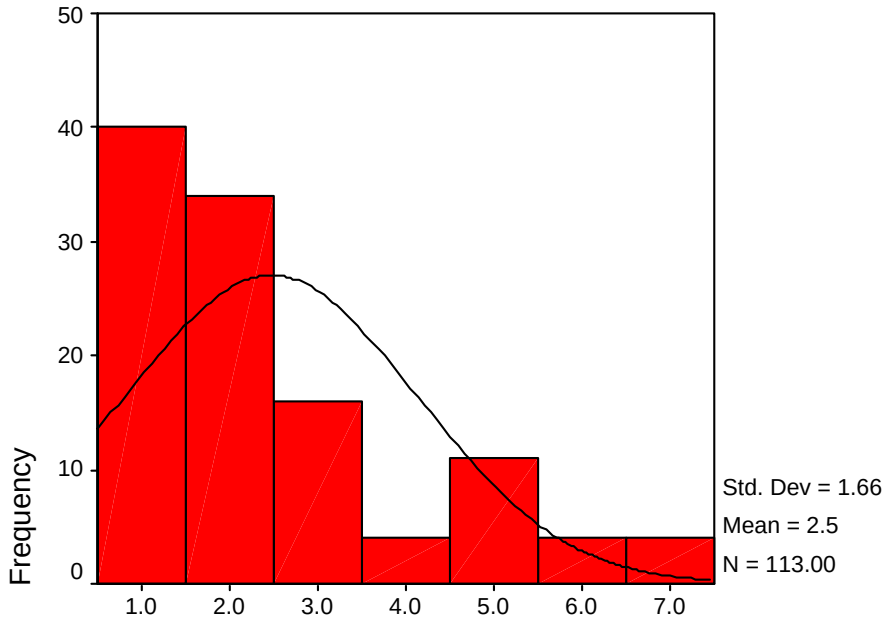


Figure 6-4 – Distribution of data for "**slides helped me follow speaker**"



As Table 6-10 shows, all three of these data sets could be considered non-parametric on the basis of statistical measures such as kurtosis, skewness, or both. Normality can be rejected if the ratio of kurtosis to its standard error is less than -2 or greater than +2. Likewise, a skewness value of more than twice its standard error is grounds for judging data to be non-normally distributed.

Table 6-10 – Kurtosis and skewness analysis for satisfaction items

Item	Ratio of kurtosis to standard error	Skewness (std. error = 0.241)
The slides in this presentation were easy to read	**6.22**	**1.974**
The colors used on these slides were pleasant to look at	**-2.36**	.300
The slides helped me follow what the speaker was saying	1.10	**1.204**

For each of the three satisfaction questions, therefore, the non-parametric Mann-Whitney analysis was used; the Mann-Whitney test measures whether two groups differ from each other based on their ranked scores. On the first question (ease of reading), the analysis found no significant difference between the Verdana (sans serif) groups and the Times New Roman (serif) groups. As Table 6-11 shows, the value of ρ was a markedly insignificant 0.668.

Table 6-11 – Effects of font style on perceived ease of reading

	"The slides in this presentation were easy to read"
Mann-Whitney U	1527.000
Wilcoxon W	3238.000
Z	-.430
Asymp. Sig. (2-tailed)	**.668**

The second satisfaction question wanted to know if groups differed in their opinion of whether or not the two color schemes used in the slide presentations were pleasant to look at. The hypothesis that addressed this question was H3b:

> H3b: **Overall satisfaction** with the learning process is **greater** when a lecture is accompanied by PowerPoint slides displayed in **high contrast** rather than **medium contrast** colors.

This item was written to specifically gauge audience reaction to our manipulation of the slide contrast variable. As with the previous satisfaction question, a Mann-Whitney analysis was chosen to test this hypothesis because of the nonparametric nature of the data. Unlike the results from the previous question, however, the Mann-Whitney test found a highly significant difference in how the two color schemes were received by their audiences. As shown in Table 6-12, the ρ-value was determined to be .0000356.

Moreover, a separate analysis that used a two-sample Kolmogorov-Smirnov test yielded a similar result, with ρ=.000325.

Table 6-12 – Significance of contrast level on "pleasant to look at"

	"The colors used on these slides were pleasant to look at"
Mann-Whitney U	884.000
Wilcoxon W	2714.000
Z	-4.134
Asymp. Sig. (2-tailed)	**.0000356**

The data summarized in Table 6-13 indicate that the *high contrast* slides (i.e., those featuring black text on an almond field) were the preferred choice, with a mean rank of 70.32 compared to 45.23 for the medium contrast groups.

Table 6-13 – Ranks for "pleasant to look at" (high vs. medium contrast)

Measure	Color Scheme	N	Mean Rank	Sum of Ranks
"The colors used on these slides were pleasant to look at"	Medium contrast	60	**45.23**	2714.00
	High contrast	53	**70.32**	3727.00
	Total	113		

The Friedman ANOVA data shown in Table 6-10 further quantify the test audiences' expressed preference for the high-contrast almond color schemes used with the Group 1 and Group 4 slides. Table 6-14 also shows that the rank scores for the medium-contrast groups (2 and 3) were clustered together at the low end (1.85 and 2.00).

Table 6-14 – Ranks by group for "pleasant to look at"

Group	Color Scheme	Mean Rank
1	High contrast (almond)	**3.20**
2	Medium contrast (blue)	**1.85**
3	Medium contrast (blue)	2.00
4	High contrast (almond)	2.96

The third and final satisfaction question—whether or not slide design affected the perceived ease with which one can follow a speaker—was, like the two questions that preceded it, analyzed using the non-parametric Mann-Whitney test. The results, summarized in Table 6-15, were nonsignificant at ρ=0.342.

Table 6-15 – Effects of font style on perceived efficacy of slides

	"The slides helped me follow what the speaker was saying"
Mann-Whitney U	1436.000
Wilcoxon W	3147.000
Z	-.950
Asymp. Sig. (2-tailed)	**.342**

After testing the three satisfaction measures separately and finding significance for the second question, I sought to combine the three measures into one item to determine if, as a single variable, they might still have a significant effect. I first performed a factor analysis to ensure that they were statistically similar enough to be reliably combined. The factor analysis produced a component matrix, shown in Table 6-16, that revealed a sufficiently high degree of positive correlation. Moreover, the reliability of this component analysis had an alpha value of 0.7184.

Table 6-16 – Correlation of components within a single satisfaction variable

	Component
	1
"The slides in this presentation were easy to read"	**.839**
"The colors used on these slides were pleasant to look at"	**.682**
"The slides helped me follow what the speaker was saying"	**.886**

Extraction Method: Principal Component Analysis

Using the new composite satisfaction variable, Hypotheses H2b and H3b above were revisited. In a one-way ANOVA, H2b produced a ρ of 0.293, indicating no significant relationship between slide design and general satisfaction levels. H3b, significant when considering the "colors were pleasant" question in isolation, was more diluted when calculated using the composite variable, slipping just below the threshold of significance at ρ=0.072.

After evaluating the relationship of slide design to learning and satisfaction using the previous hypotheses, the potential influence of contrast level was considered next. Hypothesis H3 was the first of several hypotheses to address the contrast issue, comparing the high-contrast color groups (1 and 4) to the medium-contrast color groups (2 and 3) vis-à-vis short term learning:

> H3: **Short term** learning is **greater** when a lecture is accompanied by PowerPoint slides displayed in **high contrast** rather than **medium contrast** colors.

Table 6-17 reports the results of the one-way ANOVA that compared short term learning for the high contrast and medium contrast color groups. The resulting non-significant ρ-value of 0.294 suggests the lack of a statistically meaningful relationship between contrast level and immediate learning.

Table 6-17 – Effects of contrast level on short term learning

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.269(a)	1	2.269	1.111	**.294**
Intercept	5985.490	1	5985.490	2931.101	.000
COLORCON	2.269	1	2.269	1.111	**.294**
Error	226.669	111	2.042		
Total	6223.000	113			
Corrected Total	228.938	112			

(a) R Squared = .010 (Adjusted R Squared = .001)

The findings differed little on the follow-up question of *long term* learning's relationship to slide contrast, as posited in Hypothesis H3a:

> H3a: **Long term** learning is **greater** when a lecture is accompanied by PowerPoint slides displayed in **high contrast** rather than **medium contrast** colors.

The results of the one-way ANOVA used for this analysis are presented in Table 6-18.

Table 6-18 – Effects of contrast level on long term learning

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.832(a)	1	.832	.292	**.590**
Intercept	3861.098	1	3861.098	1354.071	.000
COLORCON	.832	1	.832	.292	**.590**
Error	293.702	103	2.851		
Total	4159.000	105			
Corrected Total	294.533	104			

(a) R Squared = .003 (Adjusted R Squared = -.007)

Beginning with Hypothesis H4, the focus of the investigation shifted to group-specific combinations of both font style and color scheme. Instead of comparing the two sans serif Verdana groups to the two serif Times New Roman groups on a particular

issue, for example, I wanted to see specifically how the four unique combinations of font style and color scheme fared relative to one another.

With regard to short term learning, Hypotheses H4 and H5 in a sense represented the two *extremes* of the possible slide design combinations—sans serif with high contrast vs. serif with medium contrast:

> H4: **Short term** learning is **greatest** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** and displayed in **high contrast** colors than under **any other combination** of font and color scheme.

> H5: **Short term** learning is **weakest** when a lecture is accompanied by PowerPoint slides rendered in the font **Times New Roman** and displayed in **medium contrast** colors than under **any other combination** of font and color scheme.

Table 6-19 summarizes the one-way ANOVA results for these two hypotheses. The SPSS software used for this analysis places an asterisk next to every group for which the mean is significantly different from the one it is being compared to. In Table 6-15 this occurs only when the means for Groups 1 and 2 are compared to the means for Group 5, the only group that was not shown slides during the presentation. There was no significant difference between either Group 1 or Group 2 and any other slide-based group; the results, therefore, failed to find support for either Hypothesis H4 or H5.

Table 6-19 – Comparison of short term learning differences between groups

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
					Lower Bound	Upper Bound
1. Verdana / high contrast	2	.126	.405	1.000	-1.122	1.374
	3	.179	.394	1.000	-1.033	1.392
	4	-.229	.399	1.000	-1.458	1.000
	5	**2.064(*)**	.416	**.0000324**	.783	3.346
2. Times New Roman / medium contrast	1	-.126	.405	1.000	-1.374	1.122
	3	.054	.373	1.000	-1.094	1.201
	4	-.355	.378	1.000	-1.520	.811
	5	**1.939(*)**	.396	**.0000443**	.718	3.159

Based on estimated marginal means / (*) The mean difference is significant at the .05 level.
(a) Adjustment for multiple comparisons: Bonferroni

Counter to what had been predicted, Table 6-20 reveals that the slide design that produced the highest (though not significant) short term learning scores in this experiment was actually the combination of the serif Times New Roman font and high-contrast color—Group 4, with a mean score of 7.533.

Table 6-20 – Summary of mean short term learning scores

GROUP	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1. Verdana / High contrast	**7.304**	.300	6.712	7.897
2. Times New Roman / Medium contrast	7.179	.272	6.642	7.715
3. Verdana / Medium contrast	7.125	.255	6.623	7.627
4. Times New Roman / High contrast	**7.533**	.263	7.015	8.052
5. No slides	5.240	.288	4.672	5.808

Hypotheses H4a and H5a were the *long term* learning corollaries of H4 and H5:

> H4a: **Long term** learning is **greatest** when a lecture is accompanied by PowerPoint slides rendered in the font **Verdana** and displayed in **high contrast** colors than under **any other combination** of font and color scheme.

H5a: **Long term** learning is **weakest** when a lecture is accompanied by PowerPoint slides rendered in the font **Times New Roman** and displayed in **medium contrast** colors than under **any other combination** of font and color scheme.

In the case of long term learning, however, what limited differences there were between the slide groups and the no-slides group eroded even further. As Table 6-21 shows, the only significant difference within the long term learning data was confined to the comparison of Group 4 (Times New Roman / high-contrast) to Group 5 (no slides), providing no support for Hypotheses H4a and H5a.

Table 6-21 – Comparison of long term learning differences between groups

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig. (a)	95% Confidence Interval for Difference(a)	
					Lower Bound	Upper Bound
1. Verdana / high contrast	2	-.209	.479	1.00	-1.579	1.162
	3	-.320	.468	1.00	-1.659	1.018
	4	-.768	.468	1.00	-2.107	.570
	5	.814	.510	1.00	-.645	2.274
2. Times New Roman / medium contrast	1	.209	.479	1.00	-1.162	1.579
	3	-.111	.441	1.00	-1.373	1.150
	4	-.560	.441	1.00	-1.821	.702
	5	1.023	.486	.373	-.366	2.412
3. Verdana / medium contrast	1	.320	.468	1.00	-1.018	1.659
	2	.111	.441	1.00	-1.150	1.373
	4	-.448	.429	1.00	-1.675	.778
	5	1.134	.475	.184	-.223	2.492
4. Times New Roman / high contrast	1	.768	.468	1.00	-.570	2.107
	2	.560	.441	1.00	-.702	1.821
	3	.448	.429	1.00	-.778	1.675
	5	**1.583(*)**	.475	**.011**	.225	2.940

Based on estimated marginal means / (*) The mean difference is significant at the .05 level.
(a) Adjustment for multiple comparisons: Bonferroni

Table 6-22 shows that the slide combination that produced the greatest (though compared to the other slide-based groups, non-significant) level of long term learning was the combination of the Times New Roman font and high-contrast color (mean score, 6.483). The weakest long term learning, moreover, was associated with the group whose

slides were a combination of Verdana and high-contrast color (mean=5.714); only the group with no slides fared worse.

Table 6-22 – Summary of mean long term learning scores

GROUP	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1. Verdana / High contrast	**5.714**	.356	5.009	6.420
2. Times New Roman / Medium contrast	5.923	.320	5.289	6.557
3. Verdana / Medium contrast	6.034	.303	5.434	6.635
4. Times New Roman / High contrast	**6.483**	.303	5.882	7.083
5. No slides	4.900	.365	4.177	5.623

The final hypothesis in the experiment was intended to ascertain which specific combination of font style and contrast level produced the *least* satisfaction among participants. The satisfaction results reported earlier were more general in nature, looking at the intersection of satisfaction and either font or contrast. With Hypothesis H5b, on the other hand, I wanted to know which unique font and contrast combination, if any, was significantly weaker than the others:

> H5b: **Overall satisfaction** with the learning process is **weakest** when a lecture is accompanied by PowerPoint slides rendered in the font **Times New Roman** and displayed in **medium contrast** colors than under **any other combination** of font and color scheme.

As with the previous satisfaction measures, the Mann-Whitney sum of ranks test was used because of the nonparametric nature of the data. Since this hypothesis positioned Group 2 against the other slide-based groups, for each question to be analyzed three separate comparisons were made—Group 2 to each of Groups 1, 3, and 4. Table 6-23 shows that there was no significant difference between Group 2 (Times New Roman / medium contrast) and Groups 1, 3, or 4.

Table 6-23 – Group 2 vs. Groups 1, 3, 4 on "ease of reading"

Group 2 (Times New Roman / medium contrast) compared to:

Group 1 (Verdana / high contrast)		**Group 3 (Verdana / medium contrast)**		**Group 4 (Times New Roman / high contrast)**	
Mann-Whitney U	314.500	Mann-Whitney U	441.500	Mann-Whitney U	368.000
Wilcoxon W	590.500	Wilcoxon W	969.500	Wilcoxon W	833.000
Z	-.154	Z	-.105	Z	-.897
Asymp. Sig. (2-tailed)	**.878**	Asymp. Sig. (2-tailed)	**.917**	Asymp. Sig. (2-tailed)	**.370**

Finally, Table 6-24 shows that the other general satisfaction measure, the question of whether the slides helped participants follow what the speaker was saying, met a similar statistical fate—there was no significant difference between Group 2 and the other three slide-based groups.

Table 6-24 – Group 2 vs. Groups 1, 3, 4 on "helped follow"

Group 2 (Times New Roman / medium contrast) compared to:

Group 1 (Verdana / high contrast)		**Group 3 (Verdana / medium contrast)**		**Group 4 (Times New Roman / high contrast)**	
Mann-Whitney U	254.000	Mann-Whitney U	426.500	Mann-Whitney U	407.000
Wilcoxon W	660.000	Wilcoxon W	832.500	Wilcoxon W	813.000
Z	-1.336	Z	-.334	Z	-.212
Asymp. Sig. (2-tailed)	**.181**	Asymp. Sig. (2-tailed)	**.739**	Asymp. Sig. (2-tailed)	**.832**

Finally, I created a subset of data consisting of the twenty highest-scoring and twenty lowest-scoring participants (on short term learning) from the four slide-based groups. I then re-ran the general satisfaction tests using this specialized dataset to see if

there was any statistically significant relationship between this bifurcated population of learners and their satisfaction levels. No significant differences obtained, as the ρ-values for the Mann-Whitney tests on the three satisfaction questions were 0.758 (slides were easy to read), 0.183 (colors were pleasant to look at), and 0.108 (slides helped me follow speaker).

Test results for the original hypotheses are discussed at length in the next chapter. Included in this discussion are considerations applicable to future research in this area.

Chapter 7:
Discussion

"He…would be an utterly simple person…if he thinks written words are of any use."

— Plato, *Phaedrus*

There are two primary conclusions that can be drawn with reasonable certainty from these findings: a) the slide designs used in this study had a positive effect on learning when compared to a lecture scenario in which no slides were used, and b) participants preferred slides formatted in the high contrast combination of black text on almond to those that featured white text on medium blue.

Remembering therefore that Plato appears to have been unnecessarily clinging to tradition in his spirited attack on the revolutionary new communication technology of his day—the written word—one cannot help but draw analogies to the slideware opponents of our own time. Critics like Tufte (2003) tend to attack programs like PowerPoint on cognitive grounds, yet those who argue that PowerPoint is contributing to the "dumbing down" of audiences are, in light of these findings, perhaps disparaging the medium unfairly. While the underlying physics of the transaction may elude us at present, we cannot look at these data and ignore the fact that, at some level, the mere presence of slides appears to improve learning.

Because this study did not look at other visual classroom media—such as overhead projectors—I must necessarily bracket the discussion as being specific to the medium of slides. As a result, I cannot rule out the possibility that the findings on learning and satisfaction apply equally to other types of visual tools for the classroom. In other words, it may be that the underlying causal factors affecting things like learning and

satisfaction have to do with the proper application of particular visual principles rather than the inherent characteristics of a particular medium. From this perspective, the present study took a decidedly specific approach to such questions. All of the findings presented here must therefore be interpreted within this more parochial framework. As Shuell and Farber (2001) argue: "The way technology is used by the instructor and the student is far more important than the technology itself" (p. 120).

The ramifications of the finding on color scheme preference, however, are less clear cut. But even here there is some useful knowledge to be gleaned. Audience preference for a particular color scheme may or may not have any effect on learning, but it could nevertheless be important in the way speakers approach slide design. Persuasive presenters in sales meetings or various types of briefings, for example, might do well to consider that their audiences may be more *favorably disposed* toward their message if care is taken to avoid medium contrast combinations like white text on a medium blue field. At present, two conclusions can be drawn about contrast level: a) speakers should avoid using the white/medium blue color combination on their slides, and b) speakers, when given an option to select a high contrast color combination or a medium color contrast combination, can expect their audiences to be more satisfied with the high contrast combination.

As discussed previously in the Methods and Procedures chapter, the decision was deliberately made in the design of this study to avoid the "temptation" of testing low contrast schemes. While these schemes represent a more seductive statistical target, they do not appear to be as much of a real-world problem as the more nebulous category of medium contrast slides. For these reasons, hedging the bet by testing low contrast rather than medium contrast schemes would have amounted to sample selection bias—searching only where the hypothesized results are most likely to be found.

As for the numerous hypotheses that remain unsupported by this study—namely whether learning is positively or negatively affected by a presenter's choice of font style and contrast level—it falls to future research to say with any certainty. What I can do at present, however, is speculate on a number of factors that may have contributed to the lack of a definitive outcome. In doing so, I hope to shore up future research against several potential pitfalls.

At least two distinct phenomena may have helped to produce the inconclusive findings for the hypotheses that dealt with the potential for font style and color contrast to directly affect short term and long term learning: a) the choice of a subject population with longstanding exposure to slides in a learning-focused environment, and b) the use of minimalist slide designs that enabled learners to devote more cognitive energy to interpreting the message. Both of these factors are discussed in turn below.

Slidewise Subjects

The primary mitigating factor in the production of these relatively unremarkable results may have been the nature of the participant population; rather than representing the diversity of the general population, the subjects used in this study were primarily sophomore college students, all of whom were business majors. The population under consideration, therefore, was fairly uniform. Such uniformity may not have been an issue in many studies, but in this case it may have played a role.

More specifically, as business students of approximately the same age, it is likely that the subjects shared similar backgrounds in terms of their exposure to PowerPoint—both as users and as audience members. Given the growing prevalence of PowerPoint in secondary education, it is not unreasonable to imagine that this particular population has had from four to six years of consistent exposure to slideware programs like PowerPoint.

In that time they have doubtless seen tremendous variety in slide design, not only in terms of font style and contrast level, but numerous other elements. As a result, their cognitive processes may be engaging in what Driscoll (2000) describes as a form of *pattern recognition*, wherein words and letters of varying design are recognized by their similarity to previously-stored mental prototypes. In similar fashion, Shriffin and Schneider (1977; in Szabo & Kanuka, 1999) refer to our tendency to "automate" the process of cognitive control when we are already familiar with the visual scene we are surveying.

This sort of historical exposure may have made such an audience "slidewise"—wherein they have developed over time not only a familiarity with a wide variety of approaches to slide design but also relatively sophisticated cognitive strategies for dealing with the vagaries of those designs. To this particular population, whose very vocation at this point in their lives is learning, slides are a fact of life. The specifics of design may simply be lost on a slide-saturated population of professional learners. It would be interesting to see whether, in future research, results are more pronounced if the subject population is more diverse in terms of age and background.

Minimalist Slide Design

Though it was necessary to eliminate other aspects of slide design in order to properly isolate and research the possible effects of the two variables under consideration, in retrospect this approach may have worked against the research from the standpoint of ecological validity. If the slides I obtained via my CRTNET appeal (Appendix A) are any basis for measure, the majority of slideshows in use today are *not* stripped of clip-art, photographs, video clips, or other design elements as the slides in this experiment were.

As Rouet (2001) argues, the layering of additional information channels can potentially divert and/or dilute a learner's cognitive resources:

> The mere display of multimedia information does not mean that comprehension and learning will take place. When presenting learners with multiple sources of information (e.g., one or several texts, along with pictures or diagrams), each source has to be processed for itself, then integrated in memory. (p. 168)

It is possible, therefore, that presenting participants with slides encoded with information on only two levels—as was done in this study with the elements of font style and contrast—actually enabled them to devote a greater share of cognitive energy to decoding and interpreting these elements than is typical of most PowerPoint audience members. In future experiments, it would be wise to include additional design elements such as clip-art and photographs on the experimental slides. Doing so would have two advantages over the current experimental design: a) the slides would be more accurate from an ecological standpoint, and b) more importantly, if Rouet's (2001) model is correct, there would be greater opportunities for cognitive distraction on the part of participants as they are forced to devote more energy to processing information from elements other than font and contrast. Perhaps the corresponding decrease in the levels of intellectual energy devoted to font and contrast would be enough to cause statistically noticeable differences in learning—an outcome that found no support in the current study.

In her survey of the current state of learning psychology, Driscoll (2000) cites related research by Kahneman (1973) and Grabe (1986) and concludes that the prevailing view is that learners' attention is "a resource with limited capacity to be allocated and shared among competing goals" (p. 81). Dwyer (1970) concurs:

> The basic assumption … is that learning will be more complete as the number of cues in the learning situation increases. However, other theory and research suggest that this assumption may be tenuous at best. According to Miller and others (1957), it would be a mistake to assume that one cue added to another

> would increase learning by a linear increment. Their contention is that additional cues or excessively realistic cues may be distracting or possibly evoke competitive responses in opposition to the desired learning. (p. 236)

These viewpoints suggest, in part, that when presented with informational choices, audiences may have to prioritize the available channels and allocate their attention among them on the basis of their perceived importance. Whether elements like font style and contrast would be perceived as more, less, or equally important compared to images, video, or sound is a question (unanswered in this study) that is worth investigating in detail. As Macy, Anderson, and Krygier (1999) write: "Each added level of informational richness may explain the author's context more fully, or it may increase the possibility that users will reach a conclusion about the program's meaning that is entirely different from what the author intended" (p. 298).

Under the as-yet-untested scenario wherein slides contain additional design elements, therefore, the diminished amount of attention devoted to processing font and/or contrast might reveal differences in the depth of learning that are erased when, as in the current experiment, audiences have more cognitive energy to devote to the task at hand. Assuming there is a limited amount of cognitive power available, it makes sense to suppose that the potential impact of individual design elements on the learning process is more pronounced when each channel is given less of an opportunity to prove itself.

To be fair, this theoretical stance is not without its detractors. As Daly and Vangelisti (2003) point out, for example, several studies conducted in the 1990s by Mayer and others suggest that the counter-productiveness of visual material may only occur when the material is not directly related to the topic (the "seductive details" hypothesis). Bartsch and Coburn (2003) join in this view, citing evidence gathered by Reiber (1996). They point out, however, that the outcome may also be a function of audience members' individual learning styles (e.g. high spatial vs. low spatial ability).

Passerini and Granger (2000) summarized the results of several studies on the subject of the effectiveness of instructional technologies. Their literature review, which includes work by Tulving (1983), Goleman (1995), and Tergan (1997), led them to predict that multimodal forms of instruction "have a higher impact on learning specific content" (p. 3).

At first glance, this conclusion seems to contradict my own argument about cognitive distraction. However, a careful reading of Passerini and Granger's (2000) literature review reveals the presence of a descriptive qualifier that may be the key to unlocking any apparent discrepancies—the word *interactive*. Virtually every one of the fifteen studies they cite relate to *interactive multimedia*, not multimedia generally. In fact, the main question Passerini and Granger pose based on their review of the literature includes this very distinction: "Whether interactive multimedia applications are effective learning tools compared to traditional learning environments (textbook, or *in-class instruction*)" (p. 3, emphasis added). Hence, in the passive environment of the classroom where audience members cannot actively interact with the slide presentation, all bets may be off when it comes to the efficacy of additional layers of media beyond text and color. Such a setting does not necessarily qualify as *interactive* multimedia in the sense in which the term is being conceived of in the discussions cited.

In the end, the debate may come down to the way we conceptualize audience cognition. As Szabo and Kanuka (1999) point out, cognitive processing models such as *dual-coding theory* maintain that visual perception and verbal perception operate independently of one another, extending rather than overloading a learner's cognitive resources. As a result, under this model "the likelihood of recall is extended due to the accessibility of two mental representations instead of just one" (p. 26). Further, the authors refer to Bagui's (1998) claims that dual-coding, by providing a measure of

redundancy in the information being processed, may actually help *reduce* a learner's cognitive load.

It is possible that a mitigating concept such as *interactivity* may be the Rosetta stone that resolves the apparent conflicts over the nature of learning as it relates to slide viewing. Until then, it is clear that such debates will not be settled overnight. This fact is made even more evident when one considers the numerous open questions raised by a modest study as seemingly simple and straightforward as the present one. It is therefore appropriate to speculate in greater detail about the nature of continued research into this topic.

FUTURE RESEARCH

If one employs the metaphor of a map when thinking about future research in this area, then at least three kinds of parameters present themselves for consideration—navigational, operational, and strategic. *Navigational* parameters help us know how to read the map and these represent decisions that help give us a general orientation to the tasks at hand. *Operational* issues are the twists and turns of the terrain itself—the details that future researchers would do well to pay attention to when executing any plan. Not insignificantly, questions of ecological validity fall into this category. Finally, *strategic* parameters are the larger, theoretical issues that we bring to the table—such as the territory we are in now and the places we are trying to get to. Each of these will be discussed in turn below.

Navigational Issues

The primary navigational issue researchers in this area face is whether using the results of PC-based studies as a starting point for this study's assumptions was a productive theoretical stance. Perhaps the computer monitor and the classroom screen are as different as the latter is from the printed page—but if so, in what ways? Scholars must consider whether the ways in which audiences attend to the highly personal environment of the PC screen changes in unexpected ways when those active "users" become passive members of a lecture audience. For example, perhaps a font that is difficult to read is an annoyance on the small screen but an attention-generator when writ large. Such counterintuitive thinking may be exactly what is called for; the next generation of investigators would do well to intentionally forget everything they know about how learning works on the printed page and the PC screen and approach classroom slide-viewing as an altogether new breed of communication animal.

At the beginning of this chapter I referred to the larger theoretical question of whether slides themselves are the issue we must be most concerned with; it may be instead that the apparent effectiveness of slides lay not in their essential "slideness" but, rather, in their adherence to a more generalizable set of visual principles. Visual characteristics such as level of resolution, luminosity, color, and spatial arrangement of objects may turn out to be the causal factors in determining what makes slides and other classroom visuals more effective or less effective in producing outcomes such as learning and satisfaction. Future researchers might consider starting with such a "first principles" approach, conducting identical experiments across a variety of visual media to see if parallel results can be reached.

Operational Issues

Apart from the separate category of ecological factors (which will be discussed below), there are probably far more operational issues than readily meet the eye when conducting studies like this one, not all of which come to light even retrospectively. Nevertheless, at least two obtain at present, and both have to do with fonts.

The first of these is whether there is a threshold below which smaller point sizes begin to manifest real differences between sans serif and serif fonts. If the slides in this experiment had been displayed in 24-point font sizes, for example, would the results have been the same? Perhaps Times New Roman's serif characteristics are not cognitively disruptive at 32 points, yet it may be naïve to assume that a given font's effects occur in a contextual vacuum, completely independent of variables like point size.

Apart from size, the very choice of font type raises a separate set of issues. Were Verdana and Times New Roman the best candidates for this study? There are numerous other fonts in both the serif and sans serif categories. Would significant differences have been produced if Tahoma had gone up against, say, Garamond? New studies could vary not only the range of font sizes under study, then, but also the fonts themselves. To be sure, determining whether there are phenomena like "acceptable ranges" that vary from font to font would greatly multiply the complexity of research projects modeled after this one, but would also potentially yield far more intriguing results.

Perhaps more than anywhere else, questions of ecological validity remain front and center when considering the operational side of things. The classroom lecture is a many-splendored thing, to be sure, but this fact makes accurately reproducing it in a laboratory setting exceedingly tedious and difficult. Consider, for example, that the speech used in this experiment lasted under ten minutes. Even though I was attempting to duplicate a classroom learning environment, precious few professors deliver lectures of

such abbreviated length. To be truly valid on this point, the lectures presented would need to have been expanded to cover an entire class period (i.e., at least 45 minutes—the equivalent of a standard Monday-Wednesday-Friday class). Perhaps there are real differences in learning that result from using serif fonts instead of sans serif ones, but these differences may only show up in "fatigued" audiences who have been processing roughly four times as much information as they were given in this experiment.

A second ecological consideration is that typical classroom lecturers do not follow a script (even conversationally) and execute their bullet points only once, and in the proper order, without elaborating in places or otherwise varying the amount of time spent on each item. The former of course was precisely the format followed in this experiment. Yet without fail, in a real classroom environment some bullet points will receive more emphasis than others, perhaps being revisited by the speaker once or twice before the slide concludes. Furthermore, if a speaker elaborates on a bullet by telling, for example, an amusing story or anecdote, such behavior could improve the learning rate for that particular bullet on the basis of the extra attention the audience brings to bear on it; in relative terms, it would simply be more memorable than other bullets around it.

A related ecological issue is the physical behavior of the speaker. In the interest of eliminating possible speaker effects, my presenter in this experiment stood motionless behind a podium, without gesturing, and with relatively impersonal eye contact. In addition, in the four groups that included accompanying slides, the lighting—while typical for slide-based speakers in that particular classroom—was such that the speaker was placed in an area of relative shadow. When speakers (such as the author) use the room for their regular classroom lectures, the podium is typically not used and a remote mouse enables free and active movement around the room as a way of better engaging the student audience.

Even the speaker's reputation (*ethos*) could be considered an ecological variable. In every university and quite often elsewhere in civic life, there are lecturers who have developed a cult of personality—and this notoriety could certainly influence the way an audience processes the information on a speaker's slides. A Nobel Prize-winning physicist, for example, is likely to have greater influence over audiences than an unknown lecturer in economics fresh out of graduate school. If audiences perceive a speaker's words as having more weight, importance, or merit than average, then by definition his message is likely to have a better chance of retention. Furthermore—Nobel Prize or not—a boring speaker is likely to cause more members of the audience to tune out than would be the case were the presenter perceived as more interesting.

On the other side of the lavaliere, moreover, are the audience members. In the experiment I designed, because of issues like time constraints students were instructed not to interrupt the speaker and ask questions or make comments. This absence of speaker-audience interaction is in all likelihood atypical of the college lecture environment. And while its absence may or may not have a noticeable impact on comprehension, for the sake of ecological accuracy alone it is an operational design element that ongoing research ought to make an effort to address.

Strategic Issues

Chief among the strategic issues that long term research in this area must address is that of audience satisfaction. The next logical step will be to probe more directly the nature of satisfaction's relationship, if any, to learning, particularly in the context of multimedia where disciplines like Communication Studies have only begun to scratch the surface. To illustrate this last point, consider that an October 31, 2003 search in the online Educational Resource Information Center (ERIC) database contained twelve

entries keyed on the combination of the search terms *multimedia*, *satisfaction*, and *learning*. When *PowerPoint* was substituted for *multimedia*, the same search netted no results.

Although the question of satisfaction in the learning process may have more to do with maintaining learners' ongoing motivation levels (cf. Keller & Suzuki, 1988), for our purposes satisfaction is more intrinsic, an on-the-spot reaction to the learning experience. There is some extant research in this area, however, that can help orient future researchers looking into this question.

In the literature more directly related to Communication Studies, *attitudes* or *motivation* may be more accurate synonyms for *satisfaction*. Research by Shuell and Farber (2001) did an admirable job of summarizing a significant sampling of attitudinal research vis-à-vis the intersection of satisfaction and learning. They are worth quoting at length:

> Two studies found that students believed the use of presentation software (e.g., PowerPoint) enhanced lectures, organized the material and made it more legible, helped students pay attention in class, and served to clarify the information [Cassady, 1998; Sammons, 1997]. …Besnard et al. (1996) and Brett (1996) surveyed their students' reactions to the use of electronic communication and multimedia software for the purpose of language learning. Both studies refer to technology's effect on student motivation and technology's potential for creating more opportunities for students to engage in self-paced learning. Students found the use of technology novel and, thus, motivating, where…multimedia software presented a new and different way of learning…in contrast to text and audio modes. Hence, both the way in which technology was utilized and the fact that it was used presented novel situations for students. (p. 121)

The authors' own research seemed to concur with the results of this survey, particularly in the context of using slides "dynamically"—i.e., to do more than merely display text:

> When instructors used lecture technology in dynamic ways (pictures, graphs, animation, multimedia, and words) as opposed to static ways (words only), students agreed more strongly that the use of technology helped them learn the

> course material, increased their motivation to learn, and facilitated their understanding by illustrating concepts. In addition, when presentation software was used to display more than just words, students agreed more strongly that the use of computers to present lecture material was more beneficial for learning than the use of overhead transparencies… . (p. 129)

What remains to be seen of course is whether or not these attitudinal measures translate into *actual* improvements in learning. And on this latter point the Communication Studies literature is largely silent. Nevertheless, if perception is reality, then the fact that students *perceive* that the use of slides and other classroom technologies improve their learning may function as a self-fulfilling prophecy. In other words, if slides are perceived as being "sexier" than more traditional approaches to classroom instruction, they may automatically be more interesting and appealing, regardless of the particulars of their design. One of the primary goals of ongoing research will be to ascertain whether such connections are in fact material in nature.

Designing a Research Program

Combining the considerations discussed above, it is possible to produce a rough sketch of the expanded theoretical framework that future investigators may wish to use as a starting point as they sit down to design the next round of experiments on this topic. This matrix is presented in Figure 7-1.

Figure 7-1 – Parameters for future research

Independent Variables	Values
Font style	- Serif - Sans serif
Font size	- 32 - 28 - 24
Additional slide design constants	- Clip-art - Photographs - Video - Sound
Time	- 10 mins. - 30 mins. - 45 mins. - 90 mins.
Speaker	- reputation - dynamism - gestures - movement - bullet elaboration
Audience	- age - educational background - experience

Dependent Variables
Short term learning
Long term learning
Satisfaction
Completion times / efficiency

The author's own set of PowerPoint design rules (Earnest, 2001)—the basis for the McGraw-Hill CD-based tutorials as well as lectures given in 2002 and 2003 to MBA students at The University of Texas at Austin—are one possible starting point for an expanded program of research into the relationship of learning to slide layout. The "Rules of Design" cover seven content areas vis-à-vis slide layout and appearance:

1. Template selection
2. Contrast levels

3. Font style

4. Text management

5. Image management

6. Build effects

7. Spacing and balance

As can be seen from this list, the present experiment was confined to an examination of Rules 2 and 3. A far more massive undertaking is called for in order to successfully probe the other five categories (which would need to eventually be added to the matrix in Figure 7-1). Nevertheless, if more ecologically accurate slides are used in these studies than were used in the present one, it may be possible to design slides that test three or more of these categories simultaneously, instead of the more artificial and limiting two-layered approach used in this study.

Perhaps a research program investigating this complex of categories and variables could start by polling experienced audiences directly about: a) what they like and do not like in terms of slide layout and design, and b) what they think would make learning either more or less difficult. Their responses could be used as a basis for developing the next generation of test hypotheses. Shuell and Farber (2001) offer the following rationale for such an approach:

> Although the instructor's use of technology sets the stage for learning, it is the students' reaction to and use of the technology that determines whether the technology has an effect on their learning. Thus, students' perceptions of the uses and impact of various technologies can be useful in understanding the relationship between technology and student learning. (p. 120)

Future researchers could also take cues from a study that was similar to my own (albeit outside the discipline of Communication Studies). To wit, Szabo and Kanuka (1999) embarked on a research program to test the effects of the presence and absence of

visual design principles like *balance*, *unity*, and *focus*[10] on computer users' recall learning, study time, and completion rates. They used a slide-based tutorial on "How to Write a Term Paper" with an audience of part-time adult learners. One version of the tutorial used "good" design principles while the other used "poor" design principles (to control for color effects everything was rendered in grayscale).

What they found both mirrors my own findings and offers additional lines of investigation; recall learning was unaffected by variation in the type of design. Poor use of balance, unity, and focus, however, led to: a) the need for increased instruction time, and b) a reduction in completion rate. A future program of research that aims to test the validity of PowerPoint design rules may wish to factor in these "corollaries" of learning in addition to short term and long term comprehension and general satisfaction.

Final Thoughts

Colin Wheildon's quote at the beginning of the previous chapter—about having to rely on intuition due to a lack of empirical evidence—is in retrospect more amusing than accurate. It also points up the fact that the printed page he championed is a very different medium than the lecture screen we are dealing with, at least in terms of the latter's apparent unwillingness to give up its secrets. Whereas Wheildon was able to prove most of his hunches empirically, with few exceptions my efforts to do the same here have raised more questions than they have answered.

Nevertheless, I remain convinced that these questions are worth asking. As the survey in Chapter 1 made clear, slideware programs like PowerPoint appear to be here to stay. For better or worse, presentation slides are simply not going to go away. In fact, this new mode of presenting appears poised to become, within arenas like the higher

[10] Which they attribute to Lauer (1979) and Graves (1941), among others.

education classroom at least, one of if not the most significant influence on educational outcomes in the new century. And while the cultural critics bemoan this fact, the research presented here is cause for (at least cautious) optimism.

But questions remain, and rightly so. This research represents the beginning of a program of research, not the end. It is time for scholars in Communication Studies and related disciplines to start thinking seriously and critically about the relationship between slides (and, ultimately, visual design in general) and outcomes such as learning—and at levels of detail not previously considered. After all, in one sense asking these questions represents our fulfillment of the oldest communication requirement in the book—audience analysis.

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Appendix A:
Text of CRTNET Request for PowerPoint Slides (4/8/03)

I'm doing some research into the ways Communication Studies instructors use PowerPoint to lecture and would like to get some representative samples.

If you wouldn't mind sharing one of your PowerPoint lectures or even a few slides from a lecture, I'd appreciate it if you could email the material to me at earnest@mail.utexas.edu.

I am seeking these slides in order to understand how instructors use PowerPoint--not how they lecture or what content is included on the slides.

Materials you send me will be kept strictly confidential, and I will destroy them in July, 2003. If I want to use any materials beyond July, 2003, I will contact you directly for permission. None of these materials will be seen by or passed on to any other person.

In July, I will send an email to those who provided material to further explain the nature of my project and confirm that the slides they sent me have been disposed of.

Many thanks for your help.

Billy Earnest
The University of Texas at Austin

Appendix B:
Original Version of Faulkner's "Technology, the University, and the Transformation of Texas" (from remarks made 3/6/98)

I'm pleased that one of my first opportunities to appear as President "on deck" is to join you, the members of the Littlefield Society. Every institution has a core group of individuals who guide and sustain it, and at The University that group is here in this room. UT is fortunate to have so many devoted friends and alumni.

I describe myself as President "on deck" because I don't officially start until April 13, and in the meantime we have the good fortune of having Peter Flawn in the batter's box. I believe that with the possible exception of a few uninformed souls in Zunkerville, the rest of the state of Texas recognizes the outstanding job Dr. Flawn has been doing as interim President. I am deeply grateful for everything he's done during the past year to keep The University moving forward.

At the moment I'm doing a lot of listening. One of my most important tasks is to create an agenda on which to focus during the coming year. I am eager to have the benefit of your ideas and suggestions.

It is appropriate that the theme of this symposium is technology, because technology has had such an important role in shaping the recent history of Texas, The University, and Austin—and it will help define who we are and what role we will play in the next century.

First I think it is useful to ask why does Texas occupy the position it does in the world of technology? Why Texas and not, say, Tennessee? I believe the answer is vision. The vision of Texans in the formative stages of the Information Age. The vision of key individuals—and key institutions.

Fifty years ago, the oilfield services and defense contracting company that was to become Texas Instruments decided to diversify into new electronic technologies. TI executives Erik Jonsson and Pat Haggerty had the vision to look beyond what was safe and familiar.

Forty years ago in Dallas, Jack Kilby assembled one transistor, three resistors, and one capacitor on a semiconductor wafer to create the world's first integrated circuit. That development helped electronics become the trillion-dollar industry that it is today. Jack Kilby had vision.

In 1983, a partnership was formed between The University, the City of Austin, state government, and the business community to develop an aggressive bid to attract Microelectronics and Computer Technology Corporation—MCC—a high-technology consortium. The individuals responsible for the successful bid, some of whom are with us

today, had the foresight to see that the future of Texas would increasingly depend on emerging technology and less upon natural resources. Peter O'Donnell, George Kozmetsky, Bobby Inman, Peter Flawn, and the other leaders of that effort had vision.

At about the same time, a freshman at UT was selling souped up personal computers out of his apartment on 32nd Street not far from here. Michael Dell's vision enabled him to understand the potential of small powerful computers, to create new strategies for serving the marketplace, and to build a company with revenues in excess of 12 billion dollars.

By the late eighties, it looked as if the U.S. semiconductor manufacturing industry might wither away. But another consortium was established to restore the U.S. chip industry to world leadership. Thirteen intense rival companies were united to form Sematech, and the Austin community and The University again waged a successful campaign to bring a new endeavor to this city.

In addition, the health sciences centers in Texas have provided world leadership in medicine, biotechnology, and research. The numerous advances in medical care and innovation that have emerged from these centers have enhanced greatly the state's position in technology and contributed to our economic success.

Technology is a part of a larger continuum of change. One generation of technology is transformed by the next. The Information Age has just increased the pace of that change. We must embrace change, take steps to prepare for it, or be left behind. The states that are taking the right steps today will be at the leading edge tomorrow. Texas needs its institutions, its government, its leaders, and especially The University, to be carefully planning for the technology of the 21st century.

Texas has done extremely well of late as a result of the visionary work done in past decades. For Texas to lead in the future, I believe certain conditions must be met. We must have: 1. An environment that recognizes the importance of brain power; 2. A well-educated general population; 3. A core of critical talent educated at the highest level; 4. A venturesome spirit and the willingness to accept risk; 5. A productive volume of research, development, and enterprise in critical domains; and, 6. Strong mutual support between individuals and organizations in the fields of research, development, and enterprise.

The University of Texas, unique among Texas institutions, can contribute to all six of these areas. But we cannot be complacent and assume that we will occupy a position of leadership in addressing these needs. We must have the vision to anticipate what this institution needs in order to contribute—and to put the necessary people and resources in place.

To protect the interests of the people of Texas—and the state's stake in future technology—The University must maintain an internationally competitive position in several important fields: 1. The design and fabrication of micro- and nano-scale devices; 2. Advanced materials—new materials that will ignite a revolution in electronics,

computers, and chemistry; 3. The integration of technologies—bringing together ideas and people from the far reaches of specialization; 4. The economic, social and environmental impact of new technology—what does this change mean in human terms? 5. Human cognition—expanding technology's capacity for perception, reason, and judgment; 6. Tools for managing and integrating information; 7. Advanced simulation and modeling; and, 8. The molecular basis for biological function.

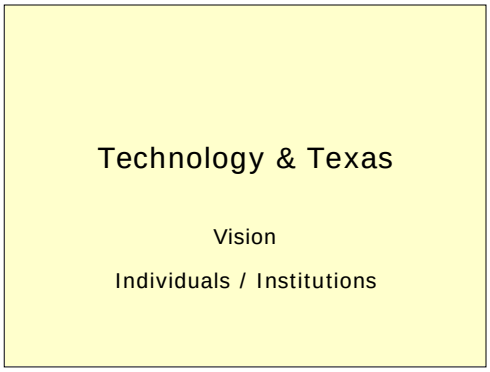
It is important to note that none of these areas fits neatly into a classic academic discipline. Interdisciplinary collaboration will have to be more than just an ideal if we are to succeed.

Every college at UT can make important contributions in one or more of these eight areas. The Deans' vision statements for their schools and colleges, as well as their work on the academic enterprise themes for the Capital Campaign, will help us chart our course.

Appendix C:
Script and Cues for Modified Faulkner Speech

This exhibit begins on the next page. In places it has been reformatted from its original appearance in order to comply with the specifications of this document format. As a result, the version reproduced here may feature elements that have a slightly cluttered or inconsistent appearance. Slides 1, 4, and 7, however, are a verbatim translation of the original format and should give the reader an accurate gauge of the original document's appearance.

1



<***down***> It is useful to ask:

<***up***> Why does Texas occupy the position it does in the world of technology? Why Texas and why not, say, Tennessee? *[pause]*

<***down***> I believe the answer *[pause]*

<***up***> is **VISION**.

{*CLICK*}

The vision of Texans in the formative stages of the Information Age.

<***down***> The vision of key **INDIVIDUALS**— *[pause]*

<***up***> and of key **INSTITUTIONS**. *[pause]*

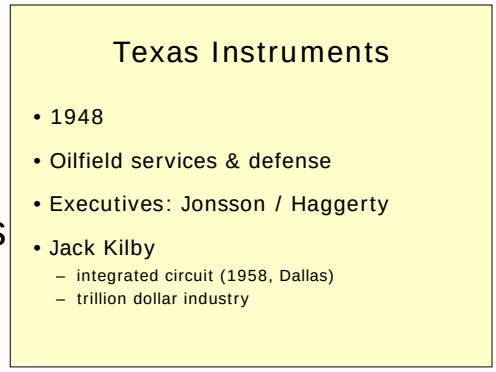
{*CLICK*}

<***down***> Technology has had such an important role in shaping the recent history of Texas, The University, & Austin—*[pause]*

<***up***> and it will help to define who we are and what role we will play in the next century. *[pause]*

{*CLICK TO NEXT SLIDE*}

2



<***up***> The history of technology in Texas began 55 years ago, back in 1948,

{*CLICK*}

<***down***> when an oilfield services and defense contractor

{*CLICK*}

that would later become Texas Instruments *[pause]*

began to diversify into electronic technology, which at the time was a new arena nobody knew much about. *[pause]*

TI was fortunate enough to have executives like Eric Johnson and Pat Haggerty.

{*CLICK*}

<***up***> Leaders who had the **VISION** to look beyond what was safe and familiar. *[pause]*

<***down***> And the vision to hire inventors like Jack Kilby.

{*CLICK*}

<***up***> In 1958, in Dallas, Kilby invented the world's first integrated circuit …

{*CLICK*}

<***down***> by putting 5 separate components onto one semiconductor wafer. *[pause]*

<***up***> It's easy to forget that the integrated circuit wasn't invented in Silicon Valley, but just up the road at TI in Dallas. *[pause]*

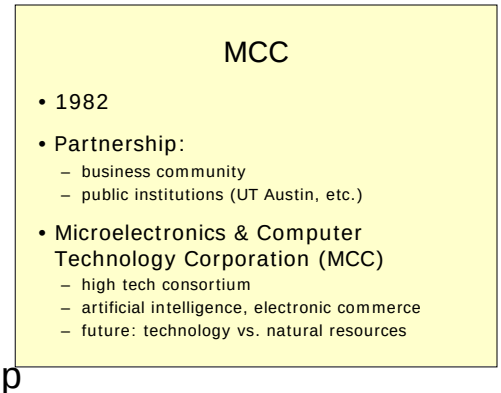
Electronics has grown into a trillion-dollar industry today,

{*CLICK*}

<***down***> because people like Jack Kilby had vision.

{*CLICK TO NEXT SLIDE*}

3



<***up***>
A little more recently,
in 1982,

{*CLICK*}

just over 20 years ago,
[pause]

A public / private partnership

{*CLICK*}

<***down***> was formed between the business community

{*CLICK*}

and public institutions like UT Austin,

{*CLICK*}

the City of Austin, and the State of Texas. *[pause]*

<***up***> These entities came together for the purpose of launching an aggressive bid aimed at attracting the Microelectronics and Computer Technology Corporation—MCC.

{*CLICK*}

<***down***> MCC is the nation's first high-tech research & development consortium. Designed in response to competitive threats from similar consortiums in other countries. *[pause]*

{*CLICK*}

<***up***> Over the years, MCC has pioneered initiatives in artificial intelligence, electronic commerce, and more. *[pause]*

{*CLICK*}

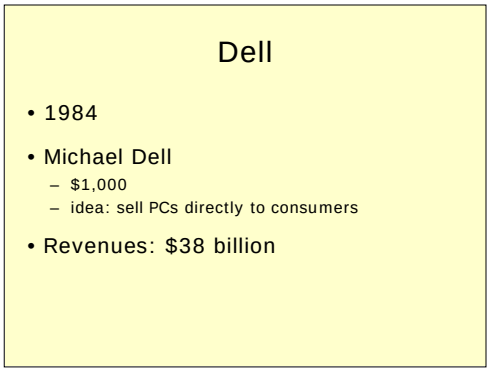
<***down***> The individuals responsible for the successful bid—Bobby Inman, Peter Flawn, and others—had vision—vision to see that the future of Texas …

{*CLICK*}

would depend more on harnessing technology than exploiting natural resources.

{*CLICK TO NEXT SLIDE*}

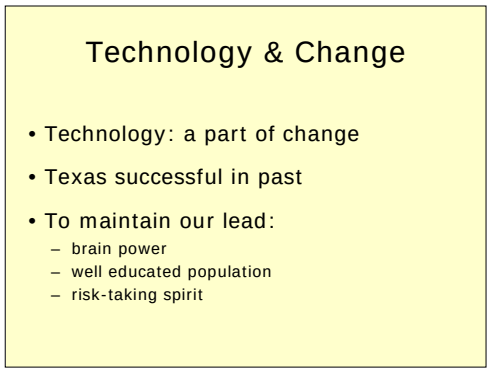
4



<*down*> In 1984,
{*CLICK*}
at about the same time MCC was getting started, so was a young UT freshman named Michael Dell. *[pause]*
{*CLICK*}
<***up***> Michael Dell had $1,000 in his bank account.
{*CLICK*}
<***down***> And he also had an idea—a really good one as it turned out—that nobody else had thought of—
<***up***> to sell small, powerful PCs, out of his apartment, directly to consumers. *[pause]*
{*CLICK*}
<***down***> So Dell Computer and its philosophy of direct sales was born. Michael Dell's vision was revolutionary.
It enabled him to understand the potential of PCs, create new strategies for serving the marketplace, and
<***up***> build a company with annual revenues of more than 38 billion dollars.
{*CLICK*}
[pause]
{*CLICK TO NEXT SLIDE*}

5

<*up*> Technology is part of a larger continuum of change.



{*CLICK*}

<*down*> And the Information Age has meant faster change—faster than ever before. We must embrace change, take steps to prepare for it, or we will be left behind.

<*up*> The State of Texas needs all of its institutions, especially UT, to be carefully planning now for the technology of tomorrow.

Texas has been extremely successful in the past …

{*CLICK*}

<*down*> as a result of the visionary work done in past decades by leaders such as Texas Instruments, MCC, and Dell. Leaders who understood that embracing change means preparing for technology. *[pause]*

<*up*> But for Texas to maintain its lead in the future,

{*CLICK*}

and to continue its success, I believe 3 conditions must be met. *[pause]*

We must have:

<*down*> One, an environment that recognizes the importance of brain power.

{*CLICK*}

<*up*> By definition, the university ought to be the brain trust of any advanced society.

Two, a well-educated population …

{*CLICK*}

<*down*> that will help create such an environment and encourage its growth, and

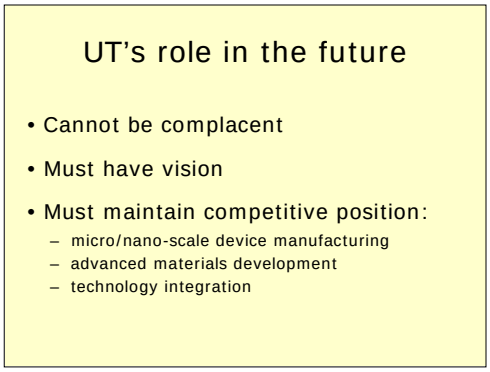
Three, a risk-taking spirit …

{*CLICK*}

<*up*> The spirit of TI, MCC, and Dell, all of whom took great chances in order to succeed.

6

<*up*> The University of Texas, unique among Texas institutions, can play a major role in the state's future by contributing to all 3 of these areas.



<*down*> But we cannot be complacent.

{*CLICK*}

We must not presume that we will automatically occupy a position of leadership in addressing these needs.

<*up*> Instead, we must have **VISION**.

{*CLICK*}

The vision to anticipate what UT needs in order to contribute and to put the necessary people and resources in place.

To help protect the state's future in technology, UT must maintain an internationally competitive position …

{*CLICK*}

in 3 important fields: *[pause]*

<*down*> One, micro- and nano-scale device manufacturing,

{*CLICK*}

to take advantage of the next big revolution in technology. *[pause]*

<*up*> Two, advanced materials development—

{*CLICK*}

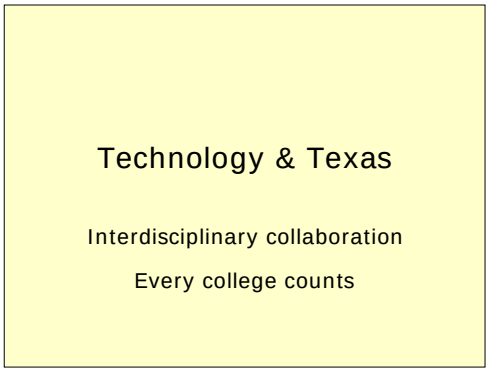
that will ignite revolutions in fields like electronics, computers, and chemistry. *[pause]*

<*down*> Three, technology integration—

{*CLICK*}

a new field that will bring together ideas and people from highly specialized, often isolated, areas.

7



<*down*> It is important to note that none of these areas fits neatly into a classic academic discipline.

<*up*> Therefore, **interdisciplinary collaboration is essential**, *[pause]*

{*CLICK*}

And it will have to be more than just an ideal if we are to succeed. *[pause]*

Every college at UT counts in this process. *[pause]*

{*CLICK*}

<*down*> **Every** college at UT can make important contributions in one or more of these areas. *[pause]*

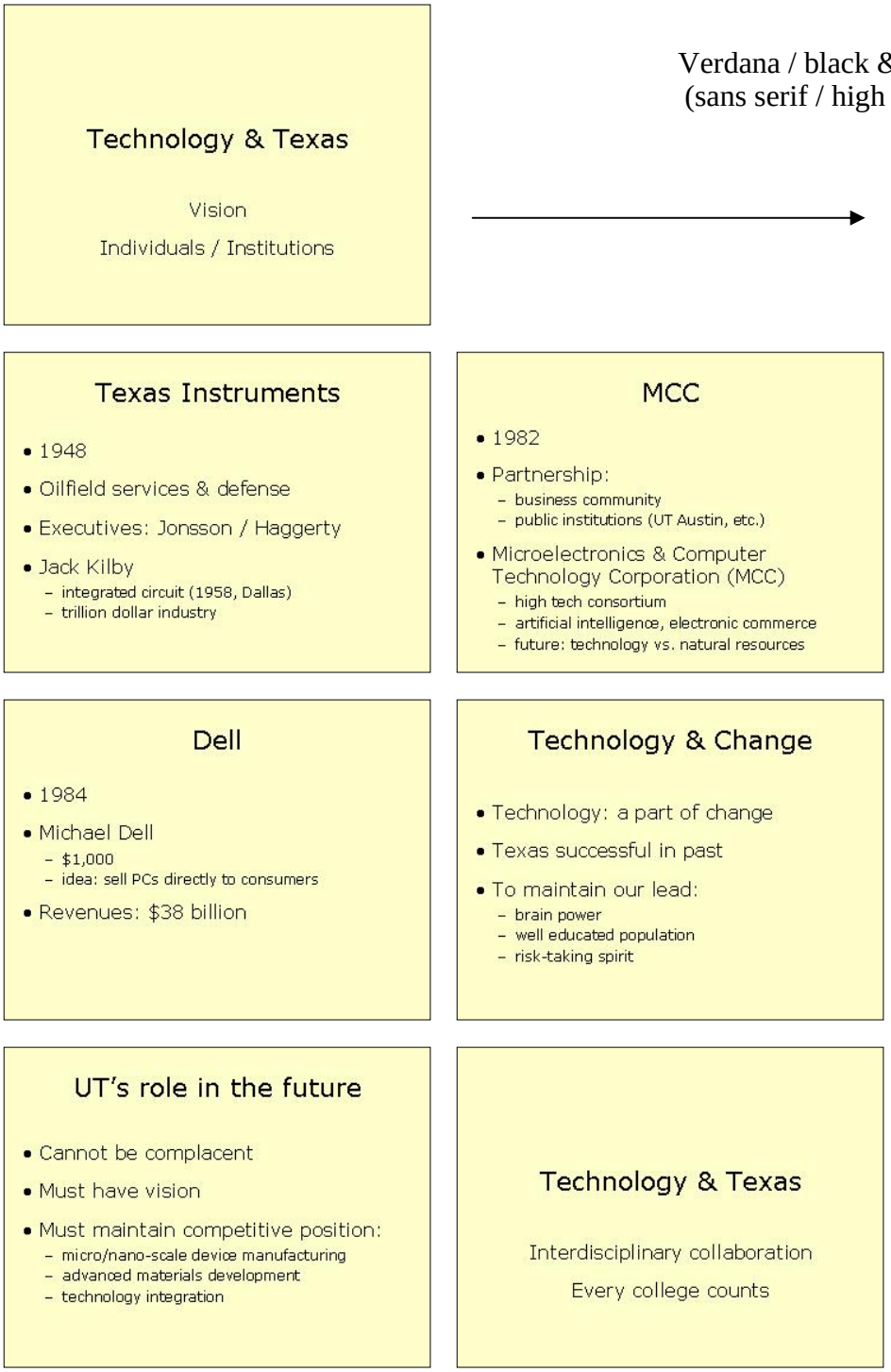
The Deans' vision statements for their individual schools and colleges will help us chart our course.

[long pause]

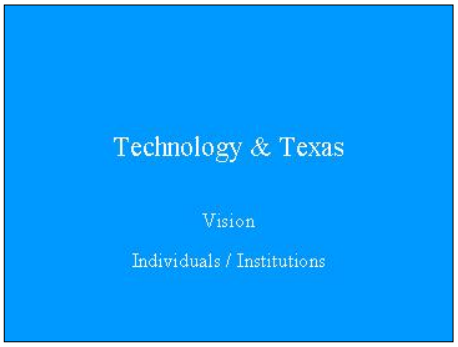
<*up*> Thank you for your time today.

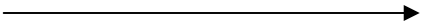
Appendix D: Slideshow Iterations

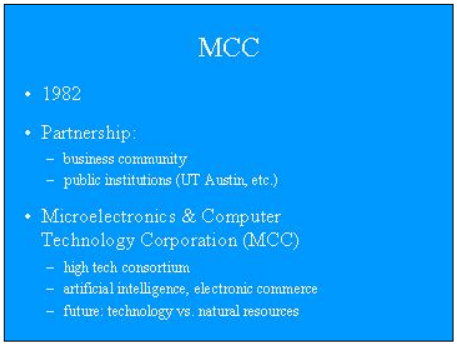
Group 1
Verdana / black & almond
(sans serif / high contrast)

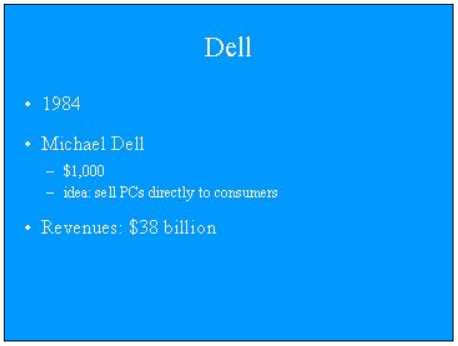


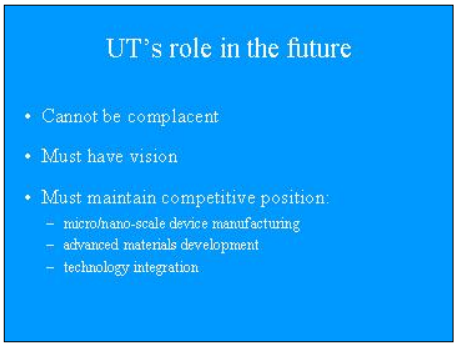
Group 2
Times New Roman / white & blue
(serif / medium contrast)











Group 3
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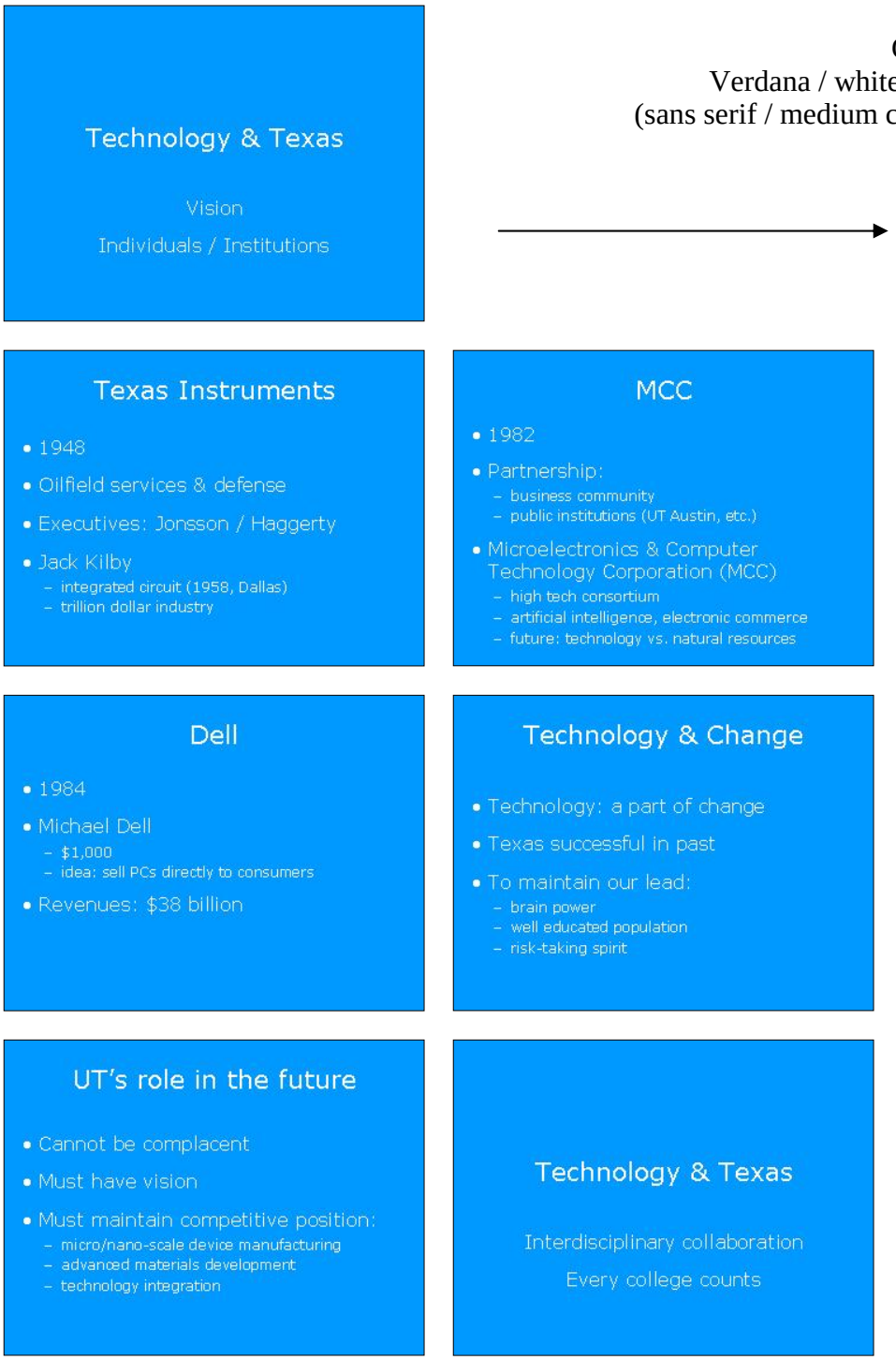
(sans serif / medium contrast)



Group 4
Times New Roman / black & almond
(serif / high contrast)

Technology & Texas

Vision

Individuals / Institutions

Texas Instruments

- 1948
- Oilfield services & defense
- Executives: Jonsson / Haggerty
- Jack Kilby
  - integrated circuit (1958, Dallas)
  - trillion dollar industry

MCC

- 1982
- Partnership:
  - business community
  - public institutions (UT Austin, etc.)
- Microelectronics & Computer Technology Corporation (MCC)
  - high tech consortium
  - artificial intelligence, electronic commerce
  - future: technology vs. natural resources

Dell

- 1984
- Michael Dell
  - $1,000
  - idea: sell PCs directly to consumers
- Revenues: $38 billion

Technology & Change

- Technology: a part of change
- Texas successful in past
- To maintain our lead:
  - brain power
  - well educated population
  - risk-taking spirit

UT's role in the future

- Cannot be complacent
- Must have vision
- Must maintain competitive position:
  - micro/nano-scale device manufacturing
  - advanced materials development
  - technology integration

Technology & Texas

Interdisciplinary collaboration

Every college counts

Appendix E:
Preliminary Instructions Issued to Participants

Good morning. In a few moments you will be given the opportunity to participate in part one of a two-part extra credit opportunity.

Before we begin, please turn off any cell phones or pagers you have with you.

Shortly you will be watching a brief, 10-minute presentation. We would like to ask you to devote your undivided attention to this presentation. Please do **NOT** take notes.

At the conclusion of the presentation, you will be asked to answer a few questions about it. Your answers will not be graded, but it is very important for you to **answer every question as accurately as possible**.

This extra credit opportunity is a two-part assignment. **In order to receive credit you will need to complete both parts**. The first part is the short questionnaire you will receive today. The second part is a very brief, follow-up survey that will be conducted **online** in approximately one week to ten days. In class next week you will be given instructions for logging on and completing the second part of the assignment. Once you have completed the second portion of the assignment, your instructor will be informed and you will be given the earned extra credit in full.

Thank you again for participating today.

Appendix F:
Short Term Learning / Satisfaction Questionnaire

First name: _____ BA 324 / Starnes / 8:00 TTH

Last initial: ____

Instructions: For questions 1-3, use the following scale. Please **circle the number** that **most accurately** describes how you feel in response to each statement below as it pertains to the presentation you just watched.

1	2	3	4	5	6	7
Strongly agree	Moderately agree	Slightly agree	Undecided	Slightly disagree	Moderately disagree	Strongly disagree

1. The slides in this presentation were easy to read. 1 2 3 4 5 6 7
2. The colors used on these slides were pleasant to look at. 1 2 3 4 5 6 7
3. The slides helped me follow what the speaker was saying. 1 2 3 4 5 6 7

Instructions: Answer questions 4-12 below as accurately as possible. Please answer **every question**. There is **no penalty** for guessing. There is **no penalty** for getting an answer wrong.

Please answer every question **without assistance** from fellow students, your instructor, or the person administering this material.

You may use pen or pencil. **Please circle your answers clearly**. When finished, please hold on to this sheet until instructed to pass it in.

4. The company now known as Texas Instruments was founded in what year?

   a. 1948
   b. 1956
   c. 1960
   d. 1977
   e. 1985

5. Before it expanded into electronic technology, what industries did Texas Instruments participate in?

   a. electric utilities & water treatment
   b. oilfield services & defense
   c. research & development
   d. instrumentation & measurement
   e. banking & insurance

6. Who invented the integrated circuit?

   a. Erik Jonsson
   b. Peter O'Donnell
   c. Michael Dell
   d. Pat Haggerty
   e. Jack Kilby

7. The first integrated circuit was assembled in what city?

   a. Dallas
   b. Austin
   c. Houston
   d. Silicon Valley
   e. Los Angeles

8. What is the full name of the technology consortium known as MCC?

   a. Microchip Calibration Corporation, Ltd.
   b. Microelectronic Computer Consortium for Technology
   c. Manufacturing Corporation of California
   d. Microelectronics and Computer Technology Corporation
   e. Microelectronic Computer Cooperative

9. What year did Michael Dell start his computer company?

   a. 1975
   b. 1977
   c. 1984
   d. 1988
   e. 1989

10. Michael Dell founded his company with how much startup money?

    a. $100
    b. $500
    c. $1,000
    d. $5,000
    e. $10,000

11. Recently, Dell's annual revenues have exceeded:

    a. $20 billion
    b. $38 billion
    c. $55 billion
    d. $100 billion
    e. $1 trillion

12. In order to help the State of Texas protect its leadership in technology, experts suggest that UT Austin must maintain an internationally competitive position in all of the following fields EXCEPT:

    a. micro-scale device manufacturing
    b. technology integration
    c. advanced materials development
    d. econometric planning
    e. nano-scale device manufacturing

[Note: The instrument as administered occupied only one page, front and back]

Appendix G:
Instructions for Completing Online Questionnaire

BA 324 / Starnes / 9:30 TTH

Instructions: Extra Credit Assignment, Part 2

Last week you watched a brief presentation and then some answered some questions afterwards. That was Part 1 of a two-part assignment.

In order to complete this assignment and receive the available extra credit, you need to complete the second part. Part 2 is extremely brief and will only take a few moments of your time.

Please follow the link below. Then just follow the instructions to complete the short survey. After you have completed the survey, your instructor will be notified and you will be given full credit for the assignment.

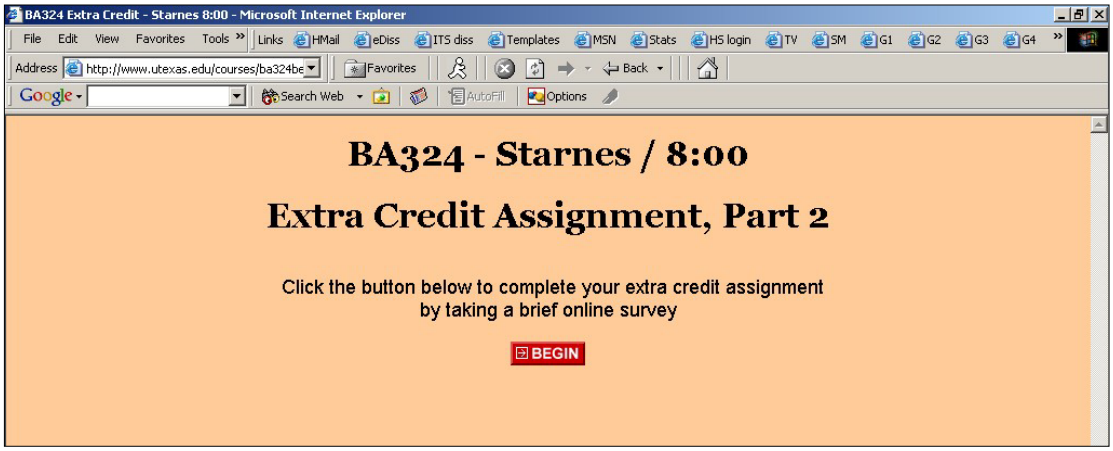
PLEASE COMPLETE THIS SURVEY BY FRIDAY, OCTOBER 3. If you do not complete it by then, your answers cannot be processed in time for you to receive the extra credit. Since it will only take you a few minutes to complete, please try to do so right away.

http://www.utexas.edu/courses/ba324be/group5.html

Thank you again for participating.

Appendix H:
Screen Shots of Online Questionnaire

1.



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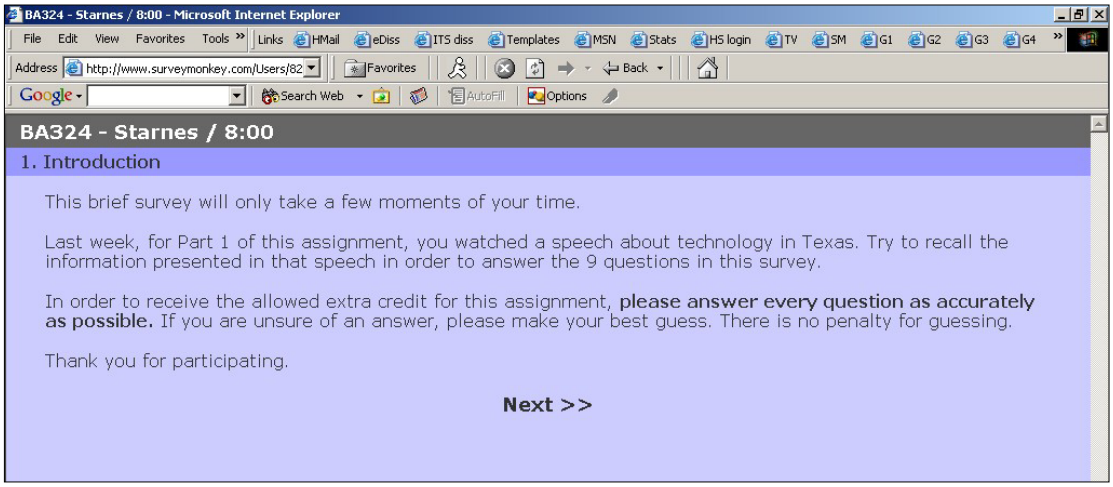

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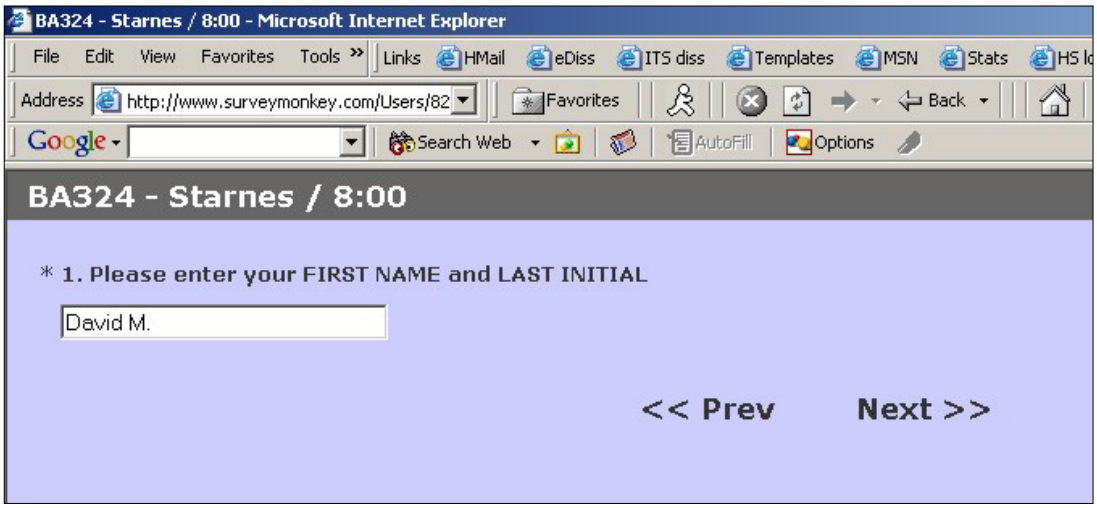
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BA324 - Starnes / 8:00
* 1. Please enter your FIRST NAME and LAST INITIAL
David M.
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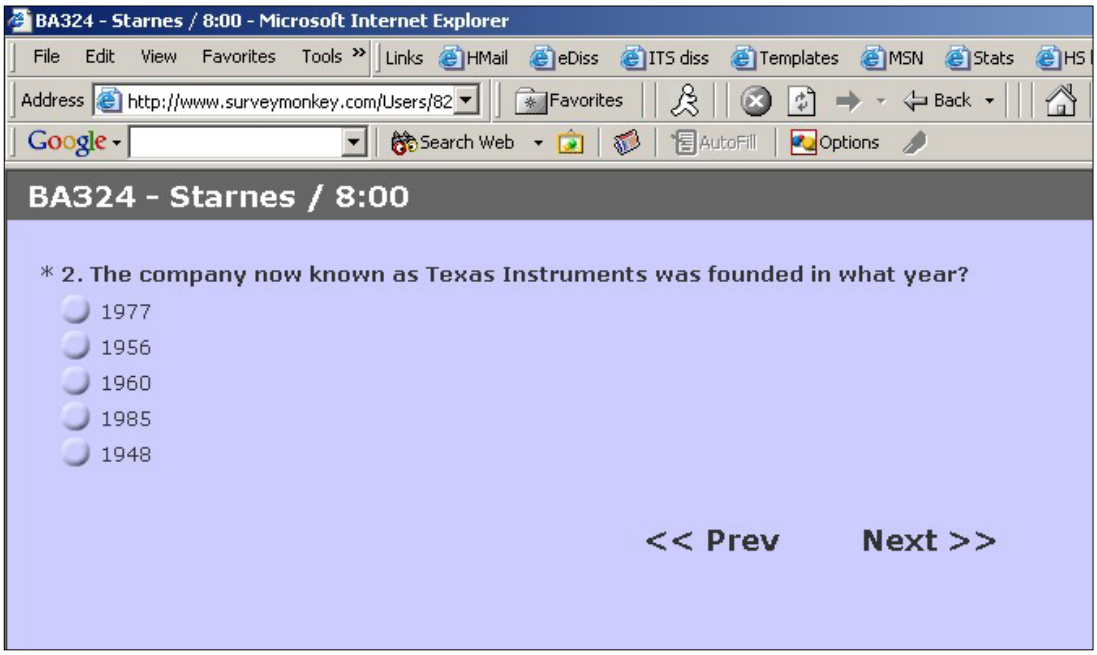
Next >>

4.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* 2. The company now known as Texas Instruments was founded in what year?
1977
1956
1960
1985
1948
<< Prev
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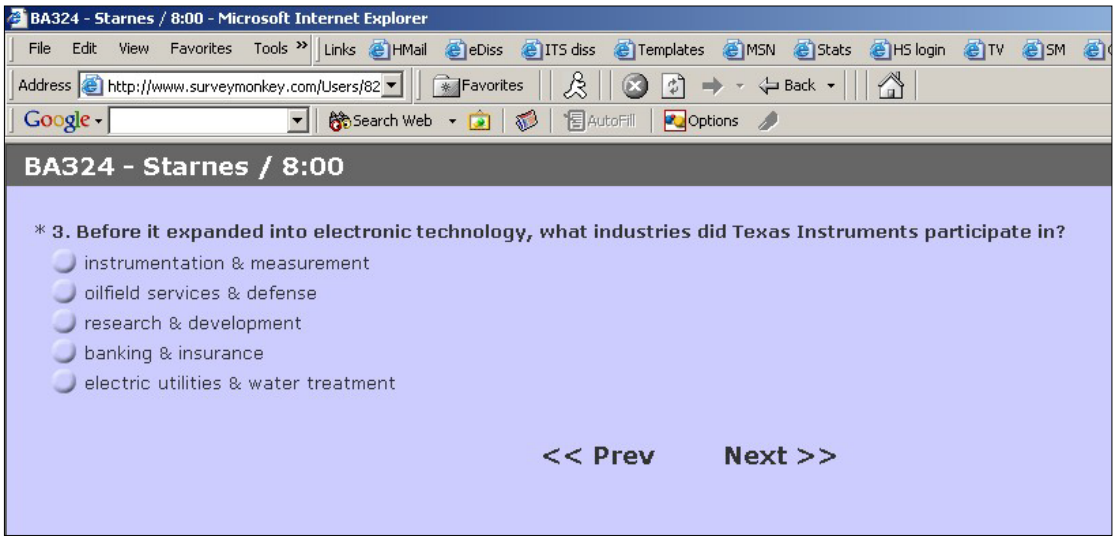
5.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* 3. Before it expanded into electronic technology, what industries did Texas Instruments participate in?
instrumentation & measurement
oilfield services & defense
research & development
banking & insurance
electric utilities & water treatment
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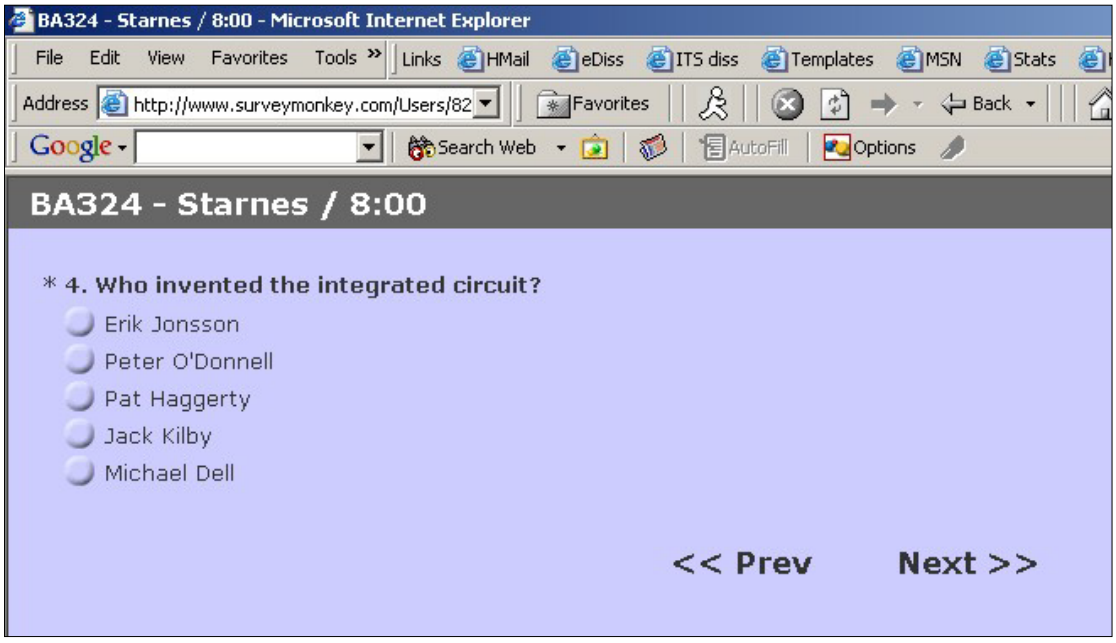
6.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BA324 - Starnes / 8:00
* 4. Who invented the integrated circuit?
Erik Jonsson
Peter O'Donnell
Pat Haggerty
Jack Kilby
Michael Dell
<< Prev
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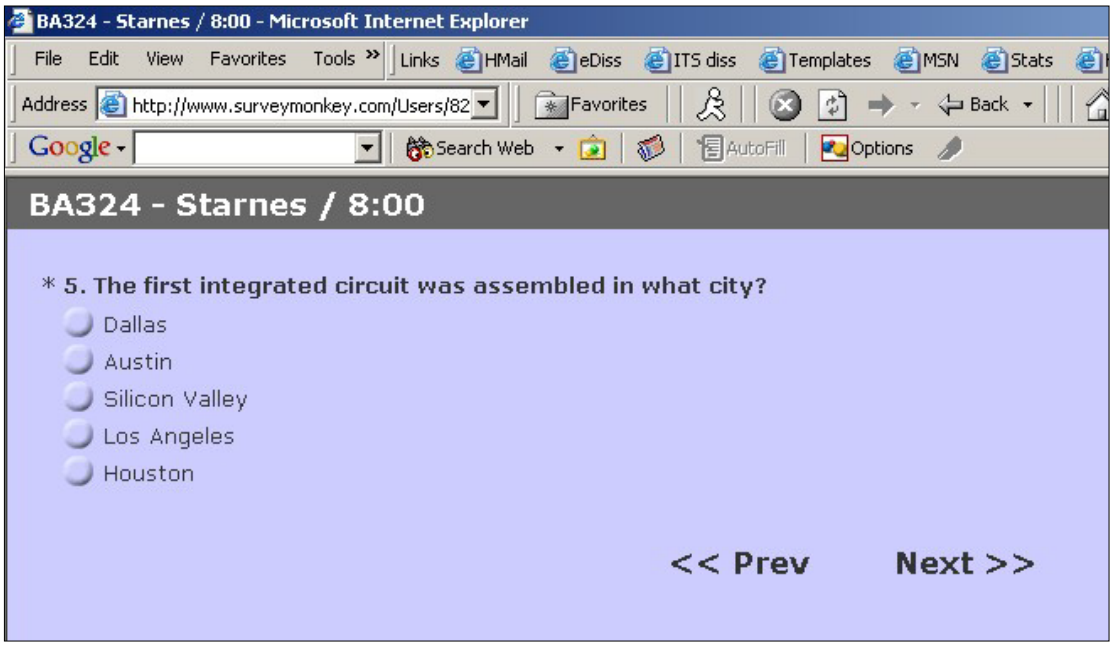
7.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* 5. The first integrated circuit was assembled in what city?
Dallas
Austin
Silicon Valley
Los Angeles
Houston
<< Prev
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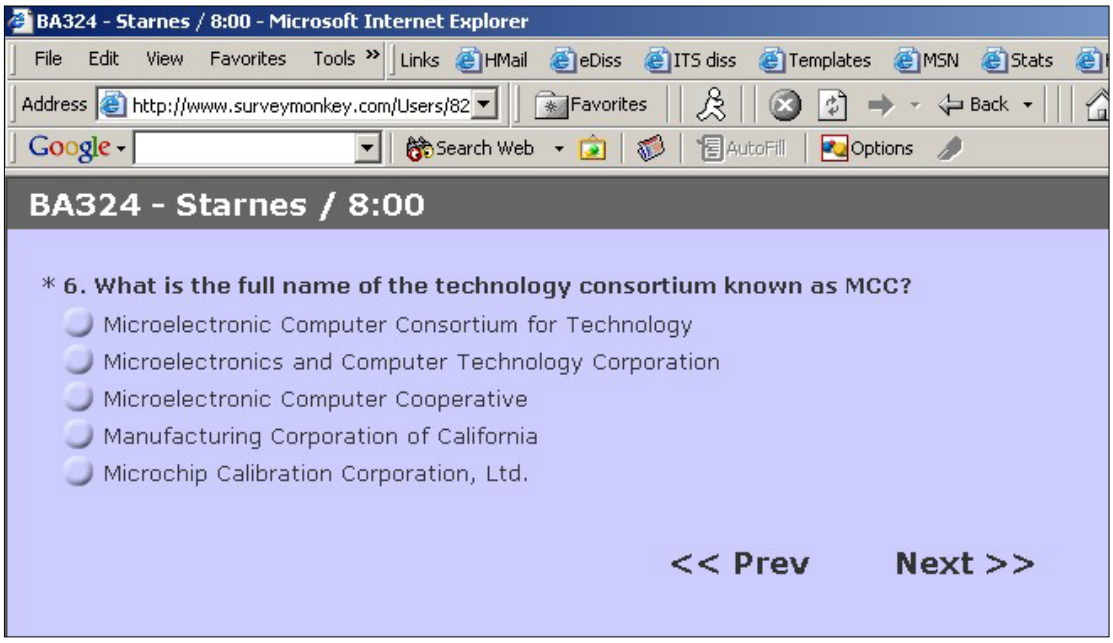
8.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BA324 - Starnes / 8:00
* 6. What is the full name of the technology consortium known as MCC?
Microelectronic Computer Consortium for Technology
Microelectronics and Computer Technology Corporation
Microelectronic Computer Cooperative
Manufacturing Corporation of California
Microchip Calibration Corporation, Ltd.
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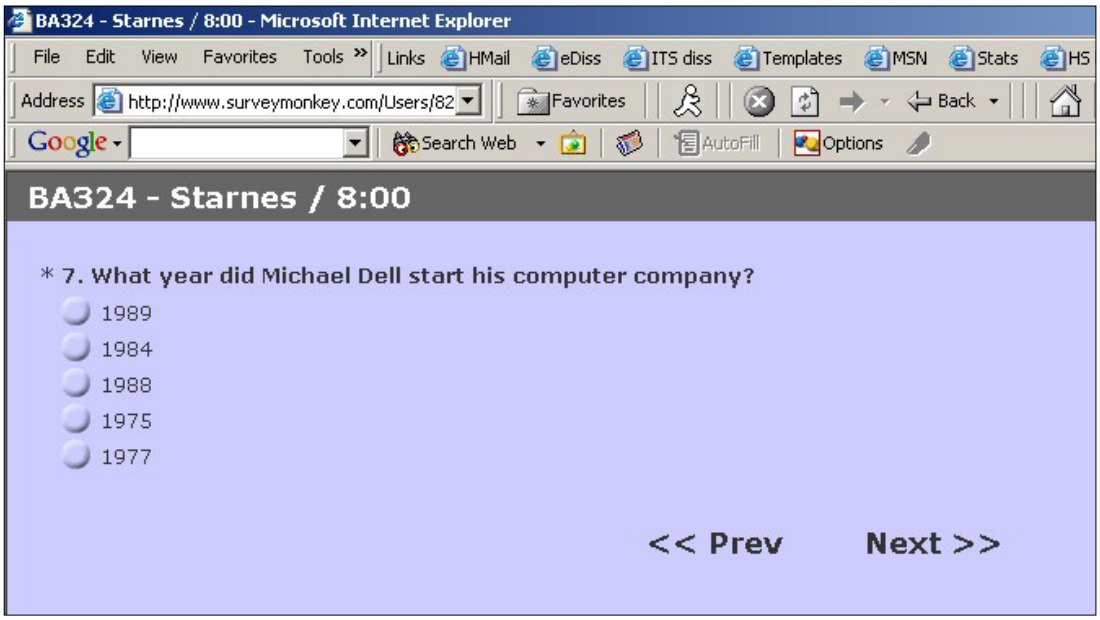
9.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* 7. What year did Michael Dell start his computer company?
1989
1984
1988
1975
1977
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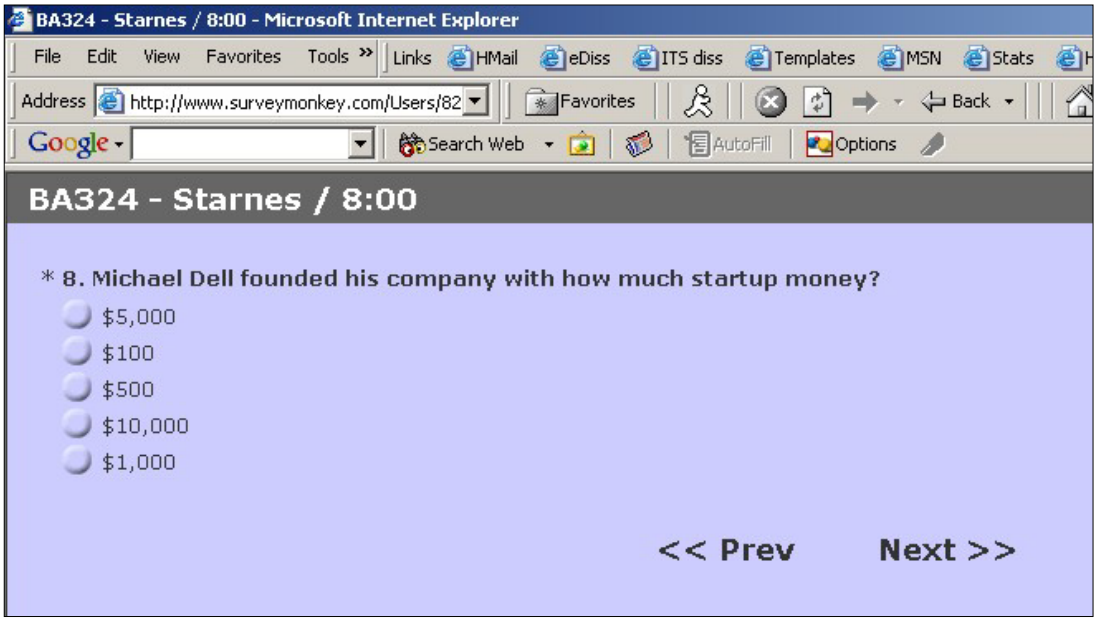
10.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BA324 - Starnes / 8:00
* 8. Michael Dell founded his company with how much startup money?
$5,000
$100
$500
$10,000
$1,000
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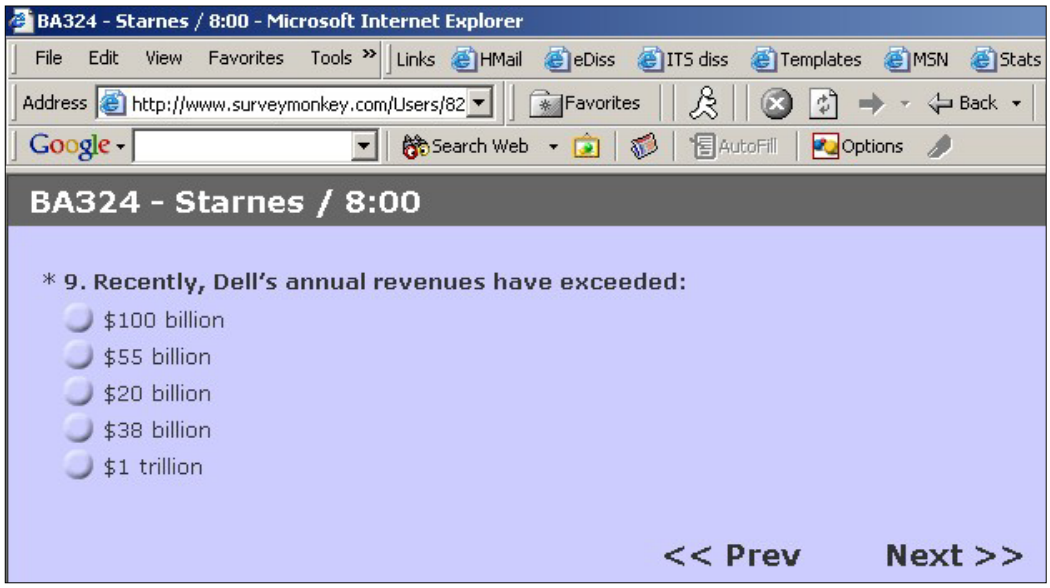
11.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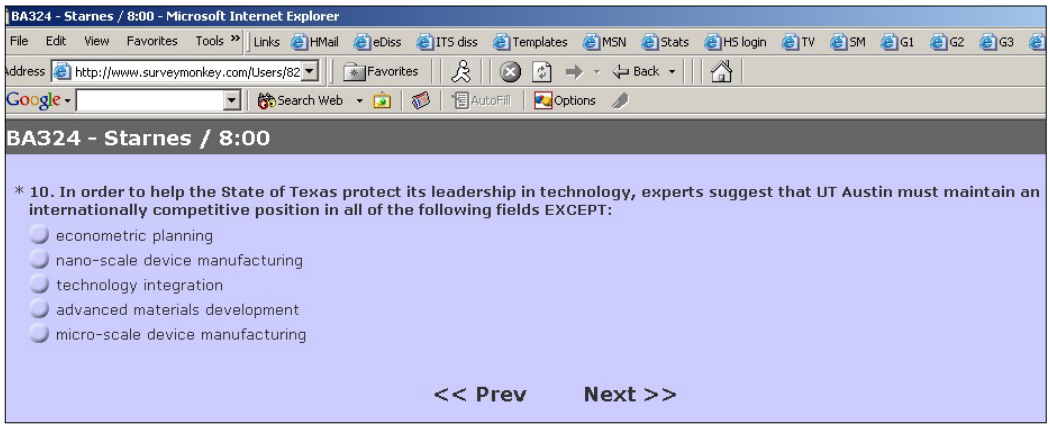
* 9. Recently, Dell's annual revenues have exceeded:
$100 billion
$55 billion
$20 billion
$38 billion
$1 trillion
<< Prev
Next >>

12.


BA324 - Starnes / 8:00 - Microsoft Internet Explorer
BA324 - Starnes / 8:00
* 10. In order to help the State of Texas protect its leadership in technology, experts suggest that UT Austin must maintain an internationally competitive position in all of the following fields EXCEPT:
econometric planning
nano-scale device manufacturing
technology integration
advanced materials development
micro-scale device manufacturing
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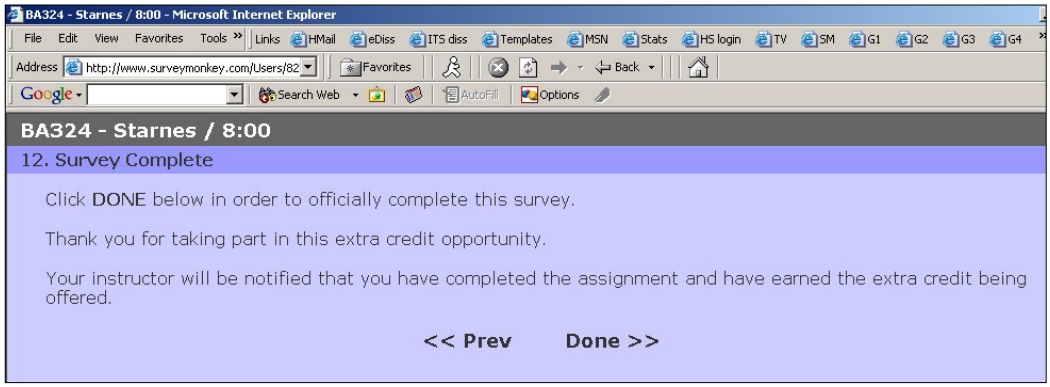
13.


BA324 - Starnes / 8:00 - Microsoft Internet Explorer
BA324 - Starnes / 8:00
12. Survey Complete
Click DONE below in order to officially complete this survey.
Thank you for taking part in this extra credit opportunity.
Your instructor will be notified that you have completed the assignment and have earned the extra credit being offered.
<< Prev
Done >>

References

Aristotle (n.d.). *On the soul* (J.A. Smith, Trans.). Retrieved July 17, 2003, from http://classics.mit.edu/Aristotle/soul.3.iii.html

Aristotle (n.d.). *Rhetoric* (W.R. Roberts, Trans.). Retrieved March 11, 2003, from http://www.non-contradiction.com/ ac_works_b31.asp

Arnold, C.C. & Frandsen, K.D. (1984). Conceptions of rhetoric and communication. In C.C. Arnold & J.W. Bowers (Eds.), *Handbook of Rhetorical and Communication Theory* (pp. 3-50). Boston: Allyn & Bacon.

Atkins-Sayre, W., Hopkins, S., Mohundro, S., & Sayre, W. (1991, November). *Rewards and liabilities of presentation software as an ancillary tool: Prison or paradise?* Paper presented at the meeting of the National Communication Association, New York, NY. (ERIC Document Reproduction Service No. ED430260).

Auer, J.J. (1989). Pride in our past—faith in our future. In W. Work & R.C. Jeffrey (Eds.), *The past is prologue* (pp. 59-64). Annandale, VA: Speech Communication Association.

Augustine of Hippo. (n.d.). *De fida et symbolo*. Retrieved March 15, 2003 from Early Church Fathers v. 2.0. http://www.ccel.org/fathers2/

Ayres, J. & Miller, J. (1994). *Effective public speaking* (4th ed.). Madison, WI: Brown & Benchmark.

Auletta, K. (2001, April 23/30). The Lost Tycoon. *The New Yorker*, *77*(9), 138-59.

Barlow, J. (2000, November 28). PowerPoint talks can be sparkling [Electronic version]. *Houston Chronicle*.

Bartsch, R.A. & Cobern, K.M. (2003). Effectiveness of PowerPoint presentations in lectures. *Computers & Education*, *41*, 77-86.

Baudrillard, J. (1983). *Simulations* (P. Foss, P. Patton, & P. Beitchman, Trans.). New York: Semiotext(e).

Beard, J. (2002, March 11). Making your point with PowerPoint. *New Jersey Law Journal*, *167*(10), 30.

Behnke, R.R. & O'Hair, H.D. (1984). Applications of high technology to communication instruction. *Central States Speech Journal*, *35*, 171-177.

Bird, L. (2001). Avoid the mistakes of PowerPoint rookies. *Smart Computing in Plain English*, *12*(1), 62-65.

Bizzell, P. & Herzberg, B. (Eds.). (1990). *The rhetorical tradition: Readings from classical times to the present*. Boston: Bedford Books.

Bochner, A.P. & Eisenberg, E.M. (1985). Legitimizing speech communication: An examination of coherence and cohesion in the development of the discipline. In T.W. Benson (Ed.), *Speech communication in the 20th century* (pp. 299-321). Carbondale, IL: Southern Illinois UP.

Bohn, E. & Jabusch, D. (1982). The effect of four methods of instruction on the use of visual aids in speeches. *The Western Journal of Speech Communication*, *46*, 253-265.

Boyarski, D., Neuwirth, C., Forlizzi, J., & Regli, S.H. (1998). A study of fonts designed for screen display. *Proceedings of CHI 98*, 87-94.

Bovée, C.L., Thill, J.V. & Schatzman, B.E. (2003). *Business communication today* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Bradford, K. (2003, March 7). Pupils' essays go high-tech: Elementary kids learn to use PowerPoint [Electronic version]. *South Bend Tribune*.

Bremmer, J. (1991). Walking, standing, and sitting in ancient Greek culture. In J. Bremmer and H. Roodenburg (Eds.), *A cultural history of gesture*. Ithaca, NY: Cornell UP.

Brigance, W.N. (1927). *The spoken word*. New York: F.S. Crofts & Co.

Brigance, W.N. (1938). *Speechmaking principles and practice*. New York: F.S. Crofts & Co.

Brigance, W.N. (1952). *Speech: Its techniques and disciplines in a free society*. New York: Appleton-Century-Crofts.

Bringhurst, R. (2001). *The elements of typographic style*. Vancouver, BC: Hartley & Marks.

Brummett, B. (1999). *Rhetoric of machine aesthetics*. Westport, CT: Praeger.

Burge, F. (2003, April 21). PowerPoint man gets attention, but no sale [Electronic version]. *Electronic Engineering Times*.

Carrell, L.J. & Menzel, K.E. (2001). Variations in learning, motivation, and perceived immediacy between live and distance education classrooms. *Communication Education*, *50*, 230-240.

Cassady, J. (1998). Student and instructor perceptions of the efficacy of computer-aided lectures in undergraduate university courses. *Journal of Educational Computing Research*, *19*, 175-189.

Clough, A.H. & Goodwin, W.H. (1905). *Plutarch's lives and writings*. New York: Colonial Company, Ltd.

Cobbs, C. (2002, January 5). A new dimension: In contemporary services, PowerPoint presentations, rap music and video mix with traditional elements of worship [Electronic version]. *Newsday*.

Cohen, H. (1985). The development of research in speech communication: a historical perspective. In T.W. Benson (Ed.), *Speech communication in the 20th century* (pp. 282-298). Carbondale, IL: Southern Illinois UP.

Cohen, H. (1994). *The history of speech communication: The emergence of a discipline, 1914-1945*. Annandale, VA: Speech Communication Association.

Collette, J. (2000). Tom Snyder Productions' PowerPoint Workshop for Teachers. *T.H.E. Journal* (Technological Horizons in Education), *27*(11), 86.

CommSearch (2nd ed.) [CD]. (1997). Annandale, VA: National Communication Association.

Corcoran, D. (2000, February 6). Campaigning for the charts that teach. *The New York Times*, BU-3.

Dahle, C. (2001, October 1). Can this off-site be saved? Skip the PowerPoint [Electronic version]. *FastCompany*.

Dale, E. (1969). *Audiovisual methods in teaching* (3rd ed.). New York: Dryden Press.

Daly, J.A. & Vangelisti, A.L. (2003). Skillfully instructing learners: how communicators effectively convey messages. In J.O. Greene & B.R. Burleson (Eds.), *Handbook of communication and social interaction skills* (pp. 871-908). Mahwah, NJ: Lawrence Erlbaum Associates.

Davis, P. (1997). What computer skills do employers expect from recent college graduates? *T.H.E. Journal* (Technological Horizons in Education), *25*(2), 74-78.

Day, S. (2003, May 29). All rise (and power on) [Electronic version]. *The New York Times.*

Delaumosne, A. (1887). *Delsarte System of Oratory*. F.A. Shaw, Trans. New York: E.S. Werner.

Denison, D.C. (2000, October 16). PowerPoint nation [Electronic version]. *The Boston Globe*.

Dondis, D.A. (1973). *A primer of visual literacy*. Cambridge, MA: The MIT Press.

Downing, J. & Garmon, C. (2001). Teaching students in the basic course how to use presentation software. *Communication Education*, *50*, 218-229.

Driscoll, M.P. (2000). *Psychology of learning for instruction*, 2nd ed. Boston: Allyn & Bacon.

Duranti, A. (1989). Oratory. In E. Barnouw (Ed.), *International Encyclopedia of Communications* (Vol. 4), (pp. 234-236). New York: Oxford UP.

Dwyer, F.M. (1970). Exploratory studies in the effectiveness of visual illustrations. *AV Communication Review*, *18*, 235-249.

Earnest, W.J. (2001). *PowerPoint: the rules of design*. [PowerPoint file on CD]. Boston: McGraw-Hill Higher Education.

Eastman Kodak Company home page. Retrieved 6/14/03 from http://www.kodak.com/US/en/corp/aboutKodak/kodakHistory/milestones33to79.shtml

Eden, K. (1997). Classical theory and criticism 2: Rhetoric. In M. Groden and M. Kreisworth (Eds.). *The Johns Hopkins guide to literary theory and criticism* [Electronic version]. The Johns Hopkins UP.

Ehninger, D., Gronbeck, B.E., McKerrow, R.E., & Monroe, A.H. (1986). *Principles and types of speech communication* (10th ed.). Glenview, IL: Scott, Foresman.

Ekman, P. (1985). *Telling lies*. New York: W.W. Norton & Co.

Endicott, J. (1998). For better presentations avoid PowerPoint pitfalls. *Presentations*, *12*(6), 36-37.

Endter, I. (1997). Sans-serif or serif? Retrieved from http://acg.media.mit.edu/courses/mas962/users/inge/ps3/p1/index.html

Esenwein, J. B. & Carnagey, D. (1915). *The Art of Public Speaking*. Springfield, MA: The Home Correspondence School.

Field, T. (2000). PowerPoint prophet. *CIO*, *14*(5), 158-164.

Finley, M.I. (1989). Hellenic world. In E. Barnouw (Ed.), *International Encyclopedia of Communications* (Vol. 2), (pp. 268-274). New York: Oxford UP.

Foster, W.T. (1908). *Argumentation and Debating*. Boston: Houghton Mifflin Co.

Friedrich, G.W. (1985). Speech communication education in American colleges and universities. In T.W. Benson (Ed.), *Speech Communication in the 20th Century* (pp. 235-52). Carbondale, IL: Southern Illinois UP.

Friedrich, G.W. (1989). Diamond jubilee. In W. Work and R. C. Jeffrey (Eds.), *The Past is Prologue: A 75th Anniversary Publication of the Speech Communication Association*. Annandale, VA: Speech Communication Association.

Garner, R. & Gillingham, M.G. (1991). Topic knowledge, cognitive interest, and text recall. *Journal of Experimental Education*, *59*, 310-319.

Golden, J.L., Berquist, G.F., & Coleman, W.E. (1993). The rhetoric of western thought (5th ed.). Dubuque, IA: Kendall/Hunt.

Graf, F. (1991). The gestures of Roman actors and orators. In J. Bremmer and H. Roodenburg (Eds.), *A cultural history of gesture*. Ithaca, NY: Cornell UP.

Gray, J. (2002, September 6). The perils of PowerPoint slides [Electronic version]. *The Globe and Mail*, p. C1.

Grice, G.L. & Skinner, J.F. (1998). *Mastering public speaking* (3rd ed.). Boston: Allyn & Bacon.

Griffin, E. (1994). *A first look at communication theory* (2nd ed.). New York: McGraw-Hill. Retrieved April 27, 2002, from http://www.afirstlook.com/archive/talkabout.pdf

Griffin, R.E., Pettersson, R., & Johnson, R. (1995, October). Electronic presentations in the corporation: How are they being used? In *Eyes of the Future: Converging Images, Ideas, and Instruction. Selected Readings from the Annual Conference of the International Visual Literacy Association*. (ERIC Document Reproduction Service No. ED391523).

Gronbeck, B.E., McKerrow, R.E., Ehninger, D. & Monroe, A.H. (1997). *Principles and types of speech communication* (13th ed.). New York: Longman.

Guffey, M.E. (2003). *Business communication: process and product* (4th ed.). Mason, OH: Thomson South-Western.

Hamill, S.S. (1890). *New Science of Elocution*. New York: Phillips & Hunt.

Hart, R.P. (1981). Speech communication as the new humanities. In G.W. Friedrich (Ed.), *Education in the '80s: Speech Communication* (pp. 35-41). Washington, DC: National Education Association.

Hart, R.P. (1994). *Seducing America: How television charms the modern voter*. New York: Oxford UP.

Hawhee, D. (2002). Bodily pedagogies: rhetoric, athletics, and the Sophists' three Rs. *College English*, *65*, 142-162.

Henley, J. (1727). *The art of speaking in publick* (2nd ed.). London: N. Cox.

Ho, B. (2001). *From using transparencies to using Powerpoint slides in the classroom*. Paper presented at the 2001 meeting of the Australian Association for Research in Education. Fremantle, Australia.

Hollands, M. (2001, July 10). Time to pull the plug on PowerPoint [Electronic version]. *The Australian*.

Ivey, K.C. (1997). Fonts on the web. Retrieved from http://www.eeicommunications.com/eye/utw/97aug.html

Jaffe, G. (2000, April 25). Pentagon cracks down on … PowerPoint. *ZDNet News*. Retrieved March 5, 2002 from http://zdnet.com.com/2100-11-502314.html

Jeffrey, R.C. (1964). A history of the Speech Communication Association of America, 1914-1964. *Quarterly Journal of Speech*, Dec., 1964. Reprinted in *The Past is Prologue* (1989), W. Work & R.C. Jeffrey, Eds. Annandale, VA: The Speech Communication Association.

Johnson, W.H. (1927). *Fundamentals in visual instruction*. Chicago: The Educational Screen.

Johnstone, Christopher Lyle. (2001). Communicating in Classical Contexts: The Centrality of Delivery. *Quarterly Journal of Speech, 87*, 121–43.

Keller, J.M & Suzuki, K. (1988). Uses of the ARCS Motivation Model in courseware design. In D.H. Jonassen (Ed.), *Instructional designs for microcomputer courseware*. London: Lawrence Erlbaum Associates.

Kellner, M.A. (2001). The eclectic slide. *Government Computer News*, *20*(26), 12.

Kennedy, G.A. (1995). Attitudes toward authority in the teaching of rhetoric before 1050. In W.B. Horner & M. Leff (Eds.), *Rhetoric and Pedagogy: Its History, Philosophy, and Practice*. Mahwah, NJ: Lawrence Erlbaum.

Kenney, K. & Scott, L.M. (2003). A review of the visual rhetoric literature. In L.M. Scott & Rajeev Batra (Eds.), *Persuasive imagery* (pp. 17-56). London: Lawrence Erlbaum Associates.

Kenny, P. (2003). Fonts for text. Retrieved from http://www.tabbyweb.com/web_notes/fonts.htm

Knapp, M.L. (in preparation). *Lying & deception in human interaction*. Unpublished book manuscript.

Kraut, R.P., Lundmark, V., Patterson, M., Kiesler, S., Mukopadhyay, T., and Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, *53*, 1017-1031.

Kroodsma, D.E. & Byers, B.E. (2000). Suggestions for slides at scientific meetings. *The Auk*, *117*, 831-835. Retrieved from http://www.zo.ntu.edu.tw/

LaPorte, R.E., Linkov, F., Villasenor, T., Sauer, F., Gamboa, C., Lovalekar, M., et al. (2001). "Papyrus to PowerPoint (P 2 P): metamorphosis of scientific communication." *British Medical Journal*, *21*, 1478-1481.

LaRue, J.C., Jr. (2003). Multi-media worship becoming norm. *Leadership*, *24*(1), 11.

Lewis, C.L. (1916). *A handbook of American speech*. Chicago: Scott, Foresman & Co.

Linkugel, W. & Berg, D. (1970). *A time to speak*. Belmont, CA: Wadsworth Publishing.

Lowe, D. (2001, September 1). Killer presentations: PowerPoint Do's and Don'ts. *On Wall Street*. Retrieved 6/13/03 from http://www.factiva.com

Lucas, S. (2001). *The art of public speaking* (7th ed.). Boston: McGraw-Hill Higher Education.

Macy, S., Anderson, E. & Krygier, J. (1999). Interactivity and meaning. In *Information Design* (pp. 293-299), R. Jacobson, Ed. Cambridge, MA: The MIT Press.

Malkewitz, K., Wright, P., & Friestad, M. (2003). Persuasion by design: the state of expertise on visual influence tactics. In L.M. Scott & R. Batra (Eds.), *Persuasive imagery: a consumer response perspective* (pp. 3-15). London: Lawrence Erlbaum Associates.

Manes, S. (1999, March 22). Project that propaganda! *Forbes, 166*, 132-134.

Maney, K. (1999, May 12). "PowerPoint obsession takes off" [Electronic version]. *USA Today*.

Mantex Newsletter 14. (1999). Retrieved March 22, 2003, from http://www.mantex.co.uk/news/news-14.htm

Marcovitz, D.M. (2001). Me become a programmer? (Using PowerPoint program as teaching tool). *Learning & Leading with Technology, 29*(3), 46-49.

Marshall, S. (2001). Font readability. Retrieved May 15, 2003 from http://www.leafdigital.com/class/lessons/graphicdesign1/3.html

Mayer, R.E. (2001). *Multimedia learning*. New York: Cambridge UP.

McDaniel, L. (2002). Beyond PowerPoint: Polishing up your presentation skills [Electronic version]. *Association Management*, *54*(2), 60-64.

McLuhan, M. (1964). *The extensions of man*. New York: McGraw-Hill.

McLuhan, M. (1967). *The medium is the massage*. New York: Random House.

McMaster, M. (2002). Missing the point: how PowerPoint may be sucking the life out of your sales presentation [Electronic version]. *Sales & Marketing Management*, *154*(9).

Mills, C.B. & Weldon, L.J. (1987). Reading text from computer screens. *ACM Computing Surveys*, *19*, 329-358.

Monroe, A.H. & Ehninger, D. (1974). *Principles and types of speech communication* (7th Ed.). Glenview, IL: Scott, Foresman.

Moreno, R. & Mayer, R.E. (2000). A coherence effect in multimedia learning: the case for minimizing irrelevant sounds in the design of multimedia instructional messages. *Journal of Educational Psychology*, *92*(1), 117-125.

Mumford, L. (1952). *Art and technics*. New York: Columbia UP.

Murphy, J. J. (1972). The origins and early development of rhetoric. In J. J. Murphy (Ed.), *A Synoptic History of Classical Rhetoric* (pp. 3-18). New York: Random House.

Neuborne, E. (2003). Top four PowerPoint gaffes [Electronic version]. *Sales & Marketing Management*, *155* (6).

Nicholls, A. (1999). *Mastering Public Speaking: How to Prepare and Deliver Winning Presentations and Successful Speeches* (5th ed.). Oxford, England: How To Books.

Nunberg, G. (1999). "The trouble with PowerPoint" [Electronic version]. *Fortune*.

Olaniran, B., Stalcup, K.A., & Jensen, K.K. (2000). Incorporating computer-mediated technology to strategically serve pedagogy. *Communication Teacher*, *15*(1), 1-4.

Oliver, R.T., Zelko, H.P., & Holtzman, P.D. (1968). Communicative speaking and listening (4th ed.). New York: Holt, Rinehart & Winston.

Ong, W.J. (1977). *Interfaces of the word: studies in the evolution of consciousness and culture*. London: Cornell UP.

Ong, W.J. (1982). *Orality and literacy: the technologizing of the word*. New York: Methuen & Co.

Parker, I. (2001, May 28). Absolute PowerPoint. *The New Yorker*, *77*(13), 76-88.

Passerini, K. & Granger, M.J. (2000, December). *The learning effectiveness of instructional technologies: Results from pilot studies.* Paper presented at the meeting of the International Academy for Information Management, Brisbane, Australia. (ERIC Document Reproduction Service No. ED473385).

Perry, T. & Perry, L.A. (1998). University students' attitudes towards multimedia presentations. *British Journal of Educational Technology, 29*, 375-377.

Peters, J.D. (1999). *Speaking into the air*. Chicago: University of Chicago Press.

Philipson, G. (2001, November 6). Feel the power and miss the point with PowerPoint [Electronic version]. *Sydney Morning Herald*.

Plutarch. (1905). Lives of the ten orators. Barcroft, C., Trans. In *Plutarch's essays and miscellanies*, vol. 5 of *Plutarch's lives and writings*, Clough, A.H. and W.W. Goodwin, Eds. The Colonial Company, New York.

Postman, N. (1985). *Amusing ourselves to death: public discourse in the age of show business*. New York: Penguin Books.

Postman, N. (1992). *Technopoly: The surrender of culture to technology*. New York: Vintage Books.

Poulakos, J. (1995). *Sophistical Rhetoric in Classical Greece*. Columbia, SC: Univ. of South Carolina Press.

Power Play. (2001, July 13). [Electronic version]. *Australian Financial Review*, 50.

Rankin, E.L. & Hoass, D.J. (2001). The use of PowerPoint and student performance. *Atlantic Economic Journal*, *29*(1), 113.

Rodenbaugh, D.W., H.L. Collins & S.E. DiCarlo (2002). Creating a simple PowerPoint multimedia game. *Advances in Physiology Education*, *26*, 342.

Rollinson, P.B. & Geckle, R. (1998). *A guide to classical rhetoric*. Signal Mountain, TN: Summertown.

Rotondo, J. (2001). Customized PowerPoint templates make life easier. *Presentations*, *15*(7), 25-26.

Rouet, J. (2001). Designing multimedia systems for learning: some lessons and further issues. In *Multimedia learning: cognitive and instructional issues* (pp. 167-172), J. Rouet, J. Levonen, & A. Biardeau, Eds. New York: Pergamon.

Schrage, M. (2003). Please stop using PowerPoint to sell: boost your effectiveness by involving prospects in presentations [Electronic version]. *Sales & Marketing Management*, *155*(6).

Seiler, W.J. (1971). The effects of visual materials on attitudes, credibility, and retention. *Speech Monographs*, *38*, 331-334.

Shuell, T.J. & Farber, S.L. (2001). Students' perceptions of technology use in college courses. *Journal of Educational Computing Research*, *24*(2), 119-138.

Siegle, D. & Foster, T. (2001). Laptop computers and multimedia and presentation software: their effects on student achievement in anatomy and physiology. *Journal of Research on Technology in Education*, *34*(1), 29-37.

Siemer, D.C. & Rothschild, F.D. (2003). *PowerPoint 2002 for litigators*. Notre Dame, IN: National Institute for Trial Advocacy (Notre Dame University).

Simmons, I.F. (1943). The Nature and Use of Audio-Visual Aids in Speech Instruction. *Southern Speech Journal*, *9*, 28-31.

Simons, T. (2001, July 1). When was the last time PowerPoint made you sing? [Electronic version]. *Presentations*, *15*(7).

Simons, T. (2002, September 1). The least we can do is allow PowerPoint to die in peace [Electronic version]. *Presentations*, *16*(9).

Sloboda, B. (2003). Creating effective PowerPoint presentations [Electronic version]. *Management Quarterly*, *44*(1).

Smith, R. (Ed.). (2002). *Inventions and Inventors*. Pasadena: Salem Press.

Staiger, J. (1992). *Interpreting films: studies in the historical reception of American cinema*. Princeton, NJ: Princeton UP.

Staiger, J. (2000). *Perverse spectators: the practices of film reception*. New York: New York UP.

Stewart, T.A. (2001, February 5). Ban it now! Friends don't let friends use PowerPoint [Electronic version]. *Fortune*.

Szabo, A. & Hastings, N. (2000). Using IT in the undergraduate classroom: should we replace the blackboard with PowerPoint? *Computers & Education*, *35*, 175-187.

Szabo, M. & Kanuka, H. (1999). Effects of violating screen design principles of balance, unity, and focus on recall learning, study time, and completion rates. *Journal of Educational Multimedia and Hypermedia*, *8*(1), 23-42.

Trueblood, T.C. (1926). A chapter on the organization of college courses in public speaking. *Quarterly Journal of Speech Education*, *12*, 1-11.

Tufte, E.R. (2003). *The cognitive style of PowerPoint*. Cheshire, CT: Graphics Press.

University of Colorado at Colorado Springs, Department of History. Retrieved 6/14/03 from http://www.web.uccs.edu/~history/

Van Pelt, J.R. (1950). Lantern slides and such. *Quarterly Journal of Speech*, *36*, 44-50.

Watson, J.S., Trans. & Ed. (1970). *Cicero on Oratory and Orators*. Carbondale, IL: Southern Illinois UP.

Weaver, A.T.. (1959). Seventeen who made history—the founders of the association. *Quarterly Journal of Speech*, April, 1959. Reprinted in W. Work & R.C. Jeffrey, (Eds.), *The Past is Prologue* (1989). Annandale, VA: Speech Communication Association.

Weber, J.J. (1930). *Visual aids in education*. Valparaiso, IN: Valparaiso University.

Weisenmiller, E.M. (1999). *A study of the readability of on-screen text*. Unpublished doctoral dissertation. Virginia Polytechnic Institute and State University.

Wheildon, C.S. (1995). *Type & layout*. Berkeley, CA: Strathmoor Press.

Wiggins, R. (1997, October 1). Will the Web browser replace PowerPoint? *Internet Outlook, 1*(8). Retrieved 6/14/03 from http://www.webreference.com.

Williams, F. (1985). Technology and communication. In T.W. Benson (Ed.), *Speech communication in the 20th century* (pp. 184-95). Carbondale, IL: Southern Illinois UP.

Wilson, R.F. (2001). HTML e-Mail: text font readability study. *Web Marketing Today*, No. 97. Retrieved May 15, 2003 from http://www.wilsonweb.com/wmt6/html-email-fonts.htm

Winans, J.A. (1917). *Public speaking* (Rev. ed.). New York: The Century Co.

Winter, I.L. (1912). *Public speaking: principles and practice*. New York: Macmillan.

Winter, I.L. (1915). *Public speaking: principles and practice* (Rev. ed.). New York: Macmillan.

Winter, I.L. (1925). *Public speaking: principles and practice* (Rev. ed.). New York: Macmillan.

Wolvin, A.D. (1981). Speech communication in applied settings. In G.W. Friedrich (Ed.), *Education in the '80s: Speech communication* (pp. 42-50). Washington, DC: National Education Association.

Work, W. & Jeffrey, R.C. (1989). Historical notes: The speech communication association, 1965-1989. In W. Work & R.C. Jeffrey (Eds.), *The past is prologue*. Annandale, VA: Speech Communication Association.

Vita

William James Earnest is the youngest child of Melvin and Mary Lou Earnest and was born November 27, 1965 in Decatur, Illinois. He completed the majority of his secondary education in the public school system of Wichita Falls, Texas. After graduating from Rider High School, he attended Midwestern State University in Wichita Falls. He received the school's Hardin Scholar award in 1988 and graduated with a BBA in Marketing in August of 1989. At the school's request, he took graduate business courses during the 1989-1990 academic year so that he could teach several marketing courses. In June 1990 he joined the Georgia Medicaid account of Electronic Data Systems (EDS) in metropolitan Atlanta. After five years with EDS and promotion to the position of Advanced Business Analyst, he returned to Texas to enroll in the UT-Austin M.A. program in Speech Communication. During his tenure as a Master's student he received the department's "Outstanding Graduate Teaching Assistant" award. After earning his Master's in 1997, he was accepted to the doctoral program in Communication Studies. In the 1997-98 school year he received the department's "Outstanding Graduate Assistant Instructor" award and was nominated by his department for a university-wide assistant instructor award. In 2000, with Mark Knapp, he published an article in *Communication Education* titled "Shall Ye Know the Truth? Student Odysseys in Truth-Seeking." That same year, he authored two versions of an undergraduate PowerPoint tutorial for McGraw-Hill Higher Education to supplement the publisher's speech communication curriculum. He joined the faculty of the McCombs School of Business at UT-Austin in the fall of 2001, where he currently teaches Business Communication as a full-time lecturer. He has twice been a guest lecturer for the McCombs MBA program's "Plus" curriculum as well as a PowerPoint training seminar leader for BBA students

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