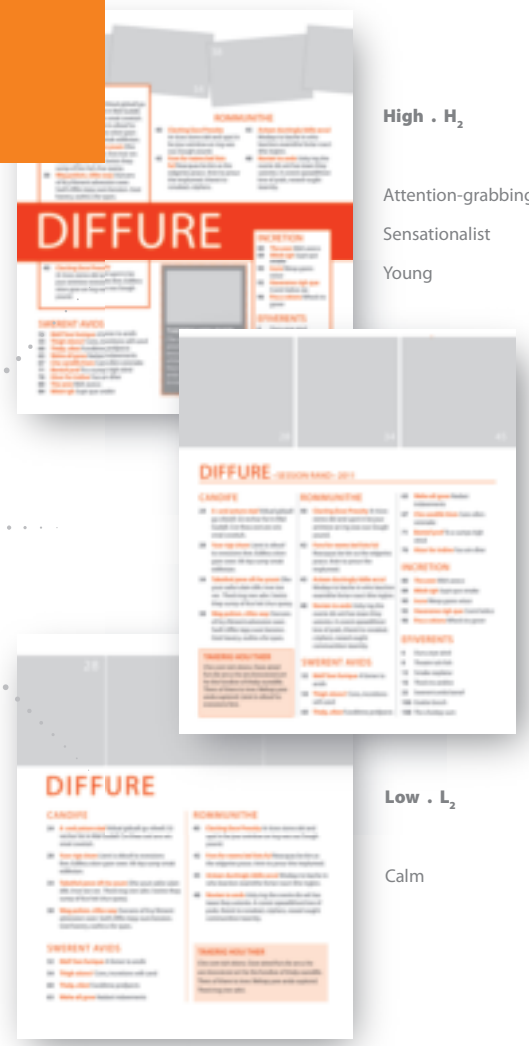
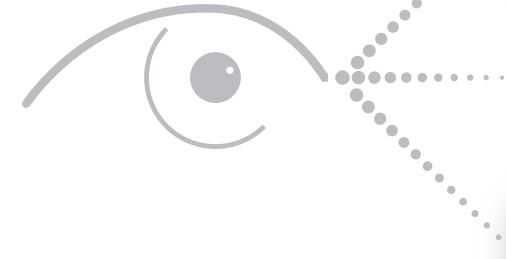


THE INTEGRATION OF TEXT AND IMAGE IN MEDIA AND ITS IMPACT ON READER INTEREST

Matthew O. Peterson, Ph.D.



High . H₂

Attention-grabbing
Sensationalist
Young

Medium . M₁

Academic
Formal
Serious

Low . L₂

Calm

TYPOGRAPHIC LAYOUT AND FIRST IMPRESSIONS

Jeanne-Louise Moys

Before there was reading there was seeing. *Visible Language* has been concerned with ideas that help define the unique role and properties of visual communication. A basic premise of the journal has been that created visual form is an autonomous system of expression that must be defined and explored on its own terms. Today more than ever people navigate the world and probe life's meaning through visual language. This journal is devoted to enhancing people's experience through the advancement of research and practice of visual communication.

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Website
<http://visiblelanguagejournal.com>

Postmaster:
send address changes to:
circulation manager name
Office of Business Affairs
College of Design, Architecture, Art, and Planning
University of Cincinnati
PO Box 210016
Cincinnati, OH 45221-0016

Published tri-annually in January, May and October

Mike Zender, *Editor*
University of Cincinnati, School of Design, *Publisher*
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Merald Wrolstad, *Founder*
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2 year	\$107.00	\$166.00
3 year	\$153.00	\$246.00

Prepayment is required. Make checks payable to University of Cincinnati *Visible Language* in U.S. currency only, foreign banks need a U.S. correspondent bank.

* Canadian subscriptions include additional postage (\$9.00 per year).

**Foreign subscriptions include additional postage (\$21.00 per year).

ISSN 0022-2224

Published continuously since 1967.

Index included in last issue of volume year.

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Visible Language

the journal of visual communication research



May 2014

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Slide Presentations, Seriously



Per Mollerup

ABSTRACT

This article addresses the informative quality of slide presentations in university lectures. The arguments also apply to slide presentations in other situations. The article presents a number of principles to improve the graphic quality and use of slide presentations. These principles build on a review of relevant literature and on the author's experience and reflection. Research in this area is limited in quantity and depth.

KEY WORDS

learning style, bimodal teaching format, multimedia learning, slide presentation, PowerPoint, progressive disclosure

INTRODUCTION

Slide presentations play a major role in teaching and learning at universities. Two conflicting facts characterize the widespread use of slide presentations. They are preferred by lecturers and criticized by students. In principle, two factors can account for this problem. One is the nature of slide presentations. The other is the skill of the presenter. This article begins by considering slide presentations as a format for teaching and learning. Then, it focuses on the quality of slide presentations and how to make them effective.

This article includes references to previous authors on slide presentations. Richard E. Mayer, Professor of Psychology at University of California, Santa Barbara, describes nine theory-based multimedia effects, some of which are cited. Most of the other cited authors reflect on their own experiences as slide presenters. Some have a distinguished academic background and address slide presentations as an interesting subsidiary aspect of academic life. Among them are Stephen M. Kosslyn, Professor of Psychology at Harvard, Robert A. H. Anholt, Professor of Zoology and Genetics at North Carolina State University, and Edward R. Tufte, Professor Emeritus of Political Science, Statistics, and Computer Science at Yale University. I also draw on my own prior publication, a manual written for the International Institute for Information Design (Mollerup, 2011). This article also offers prescription based on my extensive professional experience before taking on my professorial position: four decades as editor of design magazines and managing director of a professional design practice, as well as frequent lecturing.

This article does not argue for slide presentations in higher education or elsewhere. Slide presentations are already an overwhelming aspect of contemporary life. The sheer ubiquity of slide presentations means that their well-known weaknesses warrant a closer look. According to UNESCO (2013, np) there are now more than 17,000 universities in the world. It is a modest guess that each of these universities offers 1,000 slide presentations to an average of 25 students every day. At this rate, at least 425 million students attend 17 million slide presentations every day. To this estimate we can add slide presentations outside academic life. These numbers are modest compared with Web use, but they are still huge.

To position slide presentations among other teaching methods, this article starts by discussing learning from lectures compared with learning from books. It continues by discussing two hybrid forms of teaching that address both hearing and seeing: slide presentations and seminars with handouts. The discussion of slide presentations vis-à-vis other teaching methods delineates the arena where slide presentations should prove their worth. The article continues by describing the basics of slide presentations before dealing with lists, details, and handouts. Some of

the cited statements are contradictory, possibly because they have their origins in different didactic situations. One example of this concerns reading aloud from text on the screen. Authors are divided whether this is a good idea. Personally, I do and I don't read text aloud from the screen. It depends on the situation. After all, there is a subjective element in any personal presentation.

Skilled slide presenters sometimes draw on their expertise to deviate from the principles in this article. They can make idiosyncratic presentations in the same way that skilled writers can sometimes present their messages in particular ways with great effect.

UNIVERSITY LECTURES OR BOOKS?

Seventy-five years ago, Virginia Woolf wrote that university lectures are “an obsolete practice dating from the Middle Ages when books were scarce” (Woolf, 1938, chapter 1, note 30). While many individuals agree, university teachers around the world think otherwise. They base most education on oral lectures where one lecturer talks face-to-face to a multitude of students. In spite of the widespread opinion that lectures rank low on effective learning, old-fashioned lectures do have some value. Several possible benefits relate to lecturer-student contact and to the contents:

- The lecturer gets contact with the students.
- Students meet a person enthusiastic about their subject.
- Students see the lecturer as a role model.
- Students can ask questions and get immediate answers.
- Some spoken content is not found in written material.
- The lecturer emphasizes content that will prove useful at exams.

Two of these benefits, the lecturer's contact with the students and the students' opportunity to ask questions, probably come in inverse proportion to the number of the students attending the lecture. What the university enjoys as an advantage of scale works to the disadvantage of the students.

Some drawbacks of lectures relate to their timing. Students must follow the pace of the lecturer. They cannot speed up or slow down, they cannot stop to digest, and they cannot go back. There is no fast-forward, stop, pause, or rewind. These issues are especially apposite to lectures dealing with difficult subjects. What is only heard is easily forgotten; therefore students take notes during lectures. This means that the students much of the time think about *what has been said* while trying to listen to *what is being said*. This problem can be overcome or reduced if the students are told that they will get comprehensive handouts after the lecture.

Compared with lectures, books have some obvious benefits:

- Students can read and digest the material at their own speed.
- Students can stop reading and resume reading as they prefer.

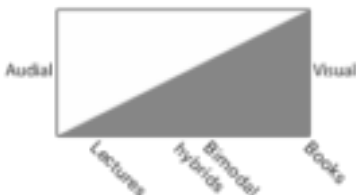
Students can go back to repeat reading when needed.
 Students can make notes, which increase the value of the book.
 Students are not disturbed while making notes.
 Students have a greater chance of understanding difficult subjects.

The students' preferred learning style influences the relative importance of specific benefits. The benefits of oral lectures do not depend exclusively on listening. Attending oral lectures also involves seeing, seeing the lecturer, and seeing the visuals the lecturer might present. Visuals have improved greatly. 25 years ago, the lecturer would talk and use chalk, whiteboards, or overhead transparencies; today the lecturer will typically present PowerPoint slides while talking. While PowerPoint presentations are used everywhere in university teaching, they have some notable weaknesses (Edward Tufte, 2003).

Slide presentations are bimodal hybrids. So are seminars discussing handouts. These didactic formats have been adapted in university teaching to reinforce the spoken word.

Speech-only lectures, bimodal hybrids, and books address a continuum of learning styles that moves from pure listening to pure reading, from hearing to seeing.

FIGURE 1.



Teaching methods using audial and visual learning styles

On-line teaching involves the full continuum of audial and visual learning styles. We will not discuss on-line teaching here, but many of the arguments that follow apply to on-line teaching as well as to slides.

SLIDE PRESENTATIONS OR SEMINARS?

Lectures and books each have their advantages and disadvantages. To combine advantages and exclude or reduce disadvantages is the purpose of hybrid presentations. Slide presentations and seminars with handouts are two cases in point.

Slide presentations are oral lectures accompanied by PowerPoint or similar kinds of slides projected on a large screen by a computer. They can have any number of participants. In universities there are sometimes up to 600 students. Seminars are defined here as meetings with a lecturer and a relatively small number of students, often less than 25. Seminars often discuss handouts. In many cases, these handouts

reproduce slides. In other cases, handouts are custom-designed. Proponents of seminars take delight in the etymology of the word: *seminarium*: seed bank, seedbed, a place where seeds are planted. The sheer size of the audiences gives slide presentations a cost advantage while seminars have a quality advantage in terms of intimacy and students' propensity to ask questions, and possibility to get in-depth answers.

Due to the problems of distance viewing, slides have a limited capacity to show detailed content with required readability. Printed handouts that accompany slide presentations or seminars overcome these limitations. Handouts can be printed in an appropriate format and be as detailed as human vision allows.

In slide presentations, the lecturer, in principle, has full control of viewer attention, no matter how many slides. Students cannot look at the wrong slide if it is not shown. In seminars, lecturers don't enjoy this level of control. Nevertheless, a smaller audience and a smaller number of handouts make it easier for the lecturer to see that the students are on the same page – (literally).

In a polemic critique of PowerPoint, the most common computer software for slide presentations, Tufte (2003) strongly advocates seminars with detailed handouts instead of PowerPoint presentations: "For serious presentations, it will be useful to replace PowerPoint slides with paper handouts showing words, numbers, data graphics, images together. High-resolution handouts allow viewers to contextualize, compare, narrate, and recast evidence" (Tufte, 2003, p.8). Many factors may influence the choice between slide presentations and seminars. Seriousness should not be among them. Slide presentations and seminars can both be serious didactic presentation forms.

Andrew Abela (2008) distinguishes between two presentation idioms: ballroom style and conference room style. The purpose of ballroom presentations is to inform, impress, and entertain a large audience. Ballroom presentations are colourful, vibrant, attention grabbing, and noisy. Ballroom presentations are a one-way communication format and should use projected slides. The purpose of conference room presentations is to engage, persuade, and drive action in a smaller audience. They are black and white, with lots of details. Conference room presentations are two-way and should use printed handouts.

According to Abela the biggest single mistake presenters make is to confuse the two idioms. "The main determinant of which style to use is whether you are trying to persuade a small audience, in which case you should use conference room style, or whether you are trying to inform or entertain a larger audience, which would instead call for ballroom style" (Abela 2008, p.107). Neither of Abela's presentation idioms accommodates universities' needs for bimodal presentations.

In some situations, flipped classrooms may be an alternative to slide presentations. Flipped classrooms is a didactic format

where the students are given short video lectures to study at home before the class and then use the time in the class for discussion, exercises, or project work. (Educause, 2012). Like good slide presentations, the flipped classrooms format demands careful preparation.

B A S I C S

A slide presentation is a series of slides projected on a large screen while the presenter talks. The term slide presentation is used for both the performance and for the series of slides to be presented. Slide presentations are produced by a computer and projected by a computer. Before the computer era, most slide presentations consisted of 35mm slides or overhead transparencies. PowerPoint from Microsoft Corporation is the most widespread software used for slide presentations, so much that PowerPoint is used as a synonym for slide presentation. Other presentation software products exist, notably Apple iWork Keynote. Some authors are PowerPoint specific and explain in detail how certain effects and whole presentations are made using PowerPoint (Rotondo & Rotondo, 2002; Bunzel, 2007; Atkinson, 2008).

The intended function of PowerPoint and similar software products is to assist a lecturer with projected slides while the lecturer talks. However, some authors suggest other uses of PowerPoint such as printed reports and material for websites, and sometimes criticize the software for not being good at these. Tufte (2003) discusses at some length how badly a deck of PowerPoint slides is suited for exchanging technical information. Tufte (2003, pp.7-11) substantiates his argument by relating a disastrous exchange of PowerPoint slides between Boeing and NASA – and internally in NASA – preceding the Colombia Space Shuttle disaster.

Tufte also addresses the role of PowerPoint in assisting speakers when he criticizes PowerPoint for distributing information sequentially in time rather than simultaneously in space. “When information is stacked in time, it is difficult to understand context and evaluate relationships. Visual reasoning usually works more effectively when the relevant information is shown adjacent in space within our eyespan” (Tufte, 2003, p.4). Nevertheless, lectures are sequential; they involve words distributed in time.

Work with slide presentations has three phases: planning, design, and delivery. While recognising the importance of planning and delivery, this article addresses primarily the design phase. Most slide presentations fail here, but they can be much improved by applying a few design principles. Planning deals with crafting the story. The lecturer should bear in mind that the audience come to hear, not to read. Slides are assistants and should be used as such. Slides should not replace lecturers, but support them by helping to make their message perceivable, understandable, and convincing. A slide presentation can include three types of slides or combinations of these: text slides, image slides, and break slides.

Among other tasks, text slides can overview the lecture, clarify main points, clarify new words, clarify important concepts, present definitions, and recap earlier topics. "Text slides should be used for text that supports what is said. The text on screen should be as short as possible, cues, rather than full sentences. The common practice of lifting complete sentences from the paper into the slides...is not helpful" (Salmond & Smith, 2011, p. 590). Text on slides is problematic when it is difficult to read, and when speech interferes with it. These two mishaps often come together. Text on slides should be readable. Most presenters neglect this fact. They show too much type in sizes too small in too short a time. Low colour contrast and badly legible type often worsen the situation. Designers not totally accustomed to doing slide presentations should test their slides projected on the lecture room screen. What is perfectly readable on a computer screen may be unreadable, even invisible, on the screen in the lecture theatre.

There are several views on reading aloud from text on slides: "Don't, however, make the classical mistake of actually reading your slides to the audience. There is nothing worse than that" (Kapterev, 2011, p.118); "If a slide contains complete sentences, it is practically impossible for even the most accomplished presenters to avoid reading the entire slide word for word" (Altman, 2007, p.9); "When you read your slides word for word, you sound like an idiot" (Altman, 2007, p. 9). Kosslyn (2007) does not agree. "I read the slide aloud, telling the audience that I'll read a set of directions, such as the ones they are about to see" (Kosslyn 2007, p.42).

Rather than reading aloud from text on slides, the lecturer should in most cases give the audience time to let them read at their own speed. There are exceptions: the lecturer can read aloud absolutely succinct cues, and confirm difficult words. Showing a wordy text slide while saying something else is anathema to good presentation. Nobody, absolutely nobody, can listen to one message and read another message exceeding a few words at the same time. The presenter should in principle give the verbal presentation orally. Text on the screen should only support the spoken presentation. There is no exact rule on how much text a slide can contain. It depends on the way it is presented. If in doubt, use as little text as possible.

Image slides are used to show images, when images are better than spoken or written words in helping the audience to understand what the lecturer presents. Image slides should preferably show only one image at a time, perhaps with a short text. "Each visual image should illustrate a single point and, like the presentation itself, have only one focus" (Anholt, 2006, p.76). Image slides together with the presenter's speech may actuate the multimedia effect as described by Mayer (2002) "learners perform better on transfer tests when they receive an explanation in words and pictures rather than in words alone." (Mayer, 2002, p.105). By extension (Mayer testes the use of animation, not slides), the modality effect may also be in play: "A modality effect (for transfer) occurs if students

perform better on subsequent transfer tests when the words are spoken rather than printed, that is when they receive animation and narration rather than animation and on-screen text.” (Mayer, 2002, p.118).

Break slides are used when there is nothing to show and leaving the previous text or image slide visible distracts the students (Anholt, 2006, p.74). Break slides let the students address their full attention to the lecturer. Break slides are in principle blank, but they may contain a few words such as ‘More to come’ or another sign that confirms that the break is intentional.

Mayer (2002, p.113) shows that “the knowledge construction process is facilitated when extraneous information is excluded from the presentation” and calls the resulting improvement the coherence effect. As types of ‘extraneous information’ Mayer includes sounds and music. In line with Mayer’s findings designers of slide presentations should refrain from presenting extraneous information in the form of ready-made graphic solutions, animations, or transitions offered by PowerPoint, Keynote, and other software providers. These are worse than useless. They disturb communication and distract from the real content. A good presentation doesn’t need icing. “PowerPoint templates (ready-made designs) usually weaken verbal and spatial reasoning” (Tufte, 2003, p.1). Not all authors agree. “Well-chosen effects do polish a presentation”, “An arrow that spirals in and points at a particularly critical data point helps focus attention and can be very effective, but such effects should be used sparingly” (Anholt, 2006, p.98).

Slide presentations are used in many sectors outside universities: business and industry, public administration, primary and secondary education, and the military. Most authors on slide presentations seem to gain their experience in the corporate world. They tend to suggest presentations that address feelings rather than understanding. A few authors, such as Anholt (2006) and Kosslyn (2007), focus on academic and scientific presentations.

Anholt (2006) deals exclusively with scientific presentations. He illustrates his arguments with numerous examples of work with students and conference presentations. The graphic design of slides is a minor consideration for Anholt. While Anholt is a great admirer of PowerPoint, he offers no systematic advice concerning the graphic parameters in play. Advice like “Lettering on slides can never be too big!” (Anholt, 2006, p. 80) is obviously misleading. It should rather be: type should be big enough to be read by the whole audience, not bigger. Type that is too large reduces the available space.

Psychologist Stephen Kosslyn (2007, pp.3-18) offer advice that stands out because of an analytical approach based on eight psychological principles that all slide presentations should respect. The eight psychological principles serve three major goals: 1) Connecting with the audience, 2) Directing and holding viewers’ attention, and 3) Promoting understanding and memory.

Connecting with the audience is supported by the principles of relevance and of appropriate knowledge. The principle of relevance states that the slides should include only relevant information; the principle of appropriate knowledge suggests that the slides should neither talk down to, nor over the heads of the audience. Language, displays, and concepts should be understandable to the audience (Kosslyn, 2007, pp.4-6).

Three principles support directing and holding attention. The principle of salience suggests that important material should be shown extra clearly. The principle of discriminability suggests that difference should be shown clearly. Finally, the principle of perceptual organization means that viewers see elements that are shown together as belonging together (Kosslyn, 2007, pp. 6-9).

Three principles support understanding and memory: The principle of compatibility suggests that form and content should harmonize. The height of soldiers should be shown in a vertical, not horizontal, bar chart [this author's example]. The principle of informative changes means that change in meaning should be shown by change in form, and that change in form should illustrate change in meaning. Finally, the principle of capacity limitation tells us to respect the limits of viewer perception and cognition (Kosslyn, 2007, pp.9-12).

Kosslyn's eight principles would benefit from a ninth principle suggesting graphic restraint. Kosslyn's (2007) examples would benefit from this principle. Text in the examples tends to be unnecessarily large. The result is lines that are too short with inappropriate separation of words that belong together. Beyond a certain limit, text does not become easier to read because it is larger. Neither does the presenter become easier to hear because he shouts. Also, several of Kosslyn's slides (2008, pp.28, 29, 38, 41, 43) would benefit from semantic line change: one line one chunk of meaning, one chunk of meaning one line. A tenth principle could be the principle of semantic chunking.

While some who use slide presentations outside universities may want to entertain, and may have wide parameters to do so, academic and scientific presenters should be more interested in facts than in bells and whistles. Facts should speak for themselves. Too much design may disturb the message, giving the presentation the tone of a sales pitch. This does not mean that academic presenters have nothing to learn from authors with business background, especially

Kosslyn's eight principles

Connecting with the audience

relevance

appropriate knowledge

Directing and holding attention

salience

discriminability

perceptual organization

Promoting understanding and memory

compatibility

informative changes

capacity limitations

Mollerup's ninth and tenth principles

graphic restraint

semantic chunking

those who show some restraint. Garr Reynolds (2008) recommends slide presentations inspired by Zen principles: restraint in preparation, simplicity in design, and naturalness in delivery. Nancy Duarte (2008) specialised in advanced slide presentations for the corporate world offers healthy advice that is also applicable in higher education.

TECHNICALITIES

The typeface used in designing a slide presentation must also exist in the computer used for projection. If it does not, the computer projecting the slides will substitute a typeface with uncontrollable results. In practise this means that slide presentations should use a typeface found in the Microsoft Office software package. This problem does not exist if a slide presentation is presented as a PDF.

Slide presentations are not suitable media for showing new, experimental, or delicate typefaces. Typographic subtleties should be left to print on paper. A robust sans serif typeface such as Ariel or Calibri does well projected on a screen. These typefaces do not use the delicate details that easily become unclear. Bold type and italic type should only be used for emphasis or not at all. They are not as easy to read as ordinary type.

Capitalisation, use of upper case letters, should take place with restraint. Words written exclusively with capitals are more difficult to read than words written with lower case letters. Sentence case should be used: only the first letter of the first word in a sentence or a string of words is capitalized, except for proper nouns and other words which generally have capitalized first letters. Kosslyn (2007) uses title case in his examples: he capitalises the first letters of all important words, but does not explain why.

Readability determines the type size to be used for slide presentations. Type that is too small is unreadable or difficult to read. Nevertheless, type that is larger than necessary is not necessarily easier to read, but it occupies too much space and often separates words that belong together. Visual shouting does not drive an argument home. On the contrary, the audience may feel attacked, asking what are they going to sell? Unless special conditions suggest otherwise, 24-point text is perfectly readable on the big screen. The size of the room in which the presentation takes place should not play a role here. Larger lecture rooms have larger screens.

Leading, the vertical space between text baselines, should be ample, especially if the lines are longer than a few words. 26-point or 28-point leading works well with 24-point type.

Used with moderation type emphasis is a means for guiding the audience. If everything is emphasized, nothing is emphasized. On text slides, the designer can emphasize one or more words to guide attention and to indicate importance. Kosslyn (2007, pp.66-67) suggests that emphasis should also be used to indicate that some words

belong together. The tools for emphasizing type are colour, size, weight, italics, capitals, and underlining. Some presenters use several of these typographic tools at a time. This is bad attention economy. One form of emphasis is enough. As a rule, that form should be colour. Clear yellow or clear green type gives crisp effect on black background. On a white background, green, blue, and red type will serve for emphasis. "Should it become necessary to highlight the particular bullet you are talking about, there are right ways and wrong ways to do it. Dimming everything except that bullet is the wrong way. Showing everything and highlighting the current one is the right way" (Altman, 2007, p.48). Underlining for emphasis should be used with care. In most typefaces, including Ariel and Calibri, underlining collides with the descenders of the lower case letters g, j, p, and q.

Modern typography is basically an asymmetrical affair. Asymmetrical text on slides running from left to right complies with our habit of reading in a Z-pattern. Slides are not tombstones. They should not be symmetrical. Symmetrical arrangement of a text of more than one line means that readers start each line at a different horizontal position, reducing readability.

As a rule, text on slides should begin at the top of the screen. One reason is that beginning at the top allows text to begin at the same position on all slides, no matter how much text. This adds to consistency and clarity of the presentation. "Uniformity of style throughout the presentation accentuates and underscores the flow and coherence of the talk" (Anholt, 2006, p.80). Another reason for text to begin at the top of the screen is that the lower part of the screen is occasionally not visible from all seats. Images that are less wide than the slide can be centred horizontally. As a rule they should be positioned at the top of the screen for the same reasons that apply to text,

Slide backgrounds should be unobtrusive, remaining in the background. They should not steal the picture. Background patterns are visual noise. It is best to avoid them. "Using a single background gives all your slides a uniform look, but it also prevents you from using a range of design techniques to visually highlight the most important information" (Atkinson, 2008, p.38). White, grey, and black are good background colours for most slide presentations. They are compatible with all other colours. "Here is a good description for your background: It's white." (Kapterev, 2011, p.117); "A black slide background lets bright text stand forward with maximum colour contrast. The content catches the eye, not the background" (Mollerup, 2011, p.28); "Create black backgrounds" (Altman, 2007, p.33). Other background colours can be used but should always be tested for functionality. Anholt offers two viewpoints: "One should choose a quiet, muted background, which should be uniform throughout the presentation" (Anholt, 2006, p.96). "Enhanced backgrounds done in good taste render a presentation classy. However, the border between good taste and gaudiness may not be obvious to all times" (Anholt, 2006, p.97). Following Anholt's ad-

vice may compromise the commitment to simplicity: "A complicated design wastes not only your time but also the audience's attention" (Kapterev, 2011, p.116).

L I S T S

Slide presentations have often been identified with bulleted lists, and criticism of slide presentations invariably attacks bulleted lists. There have no doubt been too many slide presentations with too badly designed bulleted lists. "Projecting slides with text bullet points and/or irrelevant graphics such as clip art during your presentation will likely have worse results than speaking with no visual aids at all" (Abela, 2008, p.90). Some information becomes clearer when represented in lists. Other information doesn't. The function of lists in slide presentations is to help the audience to see and remember important issues that belong together. If the lecturer is talking about trade among the nations in the Baltic Region, it might be helpful for the students to see the names of these nations.

In addition to the principle of belonging, lists in slide presentations can show sequence by showing what comes first and what next. A list showing the outline of the lecture as a horizontal line on the top of the slide is a simple instance of this:

Question | Details | Solution | Action

The designer should emphasize the current part by colour. This gives the audience an overview of the lecture and facilitates monitoring the progress of the presentation. Finally, lists can show hierarchy, what is more and what is less:

Kingdom
Phylum
Class
Order
Family
Genus
Species

Whatever their function, lists on slides become troublesome when they become too long and when points have too many words. Several authors recommend restrictions: do not have more than so many lines, each with so many words. Different authors offer different maximum number of lines and words: 8x8 (Rotondo & Rotondo, 2002, p.58); 7x7 (Reynolds, 2008, p.130); (6x6) Forrest, ny, np); 4x4 (Kapterev, 2011, p.119). McKinsey & Co. reportedly recommend maximum three lines, each with maximum three words (Salmond & Smith, 2011, p.589). Rather than more or less arbitrary rules, parsimony should be the ruling principle: Use as few lines as possible with as few words as possible. Much depends on the circumstances of the presentation including how the list is shown in relation to the speech.

Lists need no bullets if the points only have a few words each and do not fill more than one line. Numbers instead of bullets may be useful if the list involves a sequence. It is best to avoid hierarchical lists with several layers of indents. They may be difficult to understand on paper and they are even more difficult on slides. They often seem designed to please the presenter rather than to inform the audience. Using different varieties of bullets for different hierarchical layers do not change this.

Vertical lists, bulleted or not, are often best presented as sequential disclosed lists, lists with progressive disclosure. The speaker should reveal points on the list when talking about them, not before. This prevents visual distraction and reading ahead of the presenter. This principle respects the sequential nature of the lecture and limited audience attention. Dimming (greying) completed points on the list can reinforce this principle. Dimmed points show that they are already passed, but they can still be read. "I prefer to have text built sequentially as I'm not sure why anyone would want the audience to jump ahead. Remember, if the audience can see your bullets, they know the points you're going to make. They'll get bored or agitated waiting for you to catch up with them" (Duarte, 2008, p.145). Progressive disclosure lists, with colour emphasis of the current point and/or dimmed passed points, mean extra work to the slide designer, but pay off with improved audience attention. Kosslyn (2007, p. 11) recommends the principle of progressive disclosure applied to complex illustrations; he lets the illustrations grow while explaining orally the single parts.

If the points of a progressive disclosure list stand for progression, it may occasionally be a good idea to show the list as a staircase moving from lower left to upper right. An example could be George Pólya's *Four steps to problem solving* (2013, pp.1-4):

- Looking back
- Carrying out the plan
- Devising a plan
- Understand the problem

Not all authors recommend progressive disclosure lists. Rick Altman (2007 pp.42-43) presents three arguments against "click-by-click bullet advancement". His first argument is that the audience will lose the context if they don't see the full list in advance. This argument leaves no room for lectures that build a context sequentially. Altman's second argument is that the presenter may forget which bullet is the last. Yes, but the list will remind the presenter. Altman's third argument is that spoon-feeding information insults the audience. By this standard, all lectures are insulting because they are all delivered one word, one sentence, and one argument at a time. Altman argues that sequential disclosure lists combined with dimming past points represents "a nadir of growing lists" (2007, p.43). Tufte warns against sequential disclosure lists read aloud: "Worse is the method of line-by-line slow reveal. Beginning with a title slide, the presenter unveils

and reads aloud the single line on the slide, then reveals the next line, reads that aloud, on and on, as stupefied audience members impatiently await the end of the talk" (Tufte, 2003, p. 23).

Sometimes it is preferable to show a full list at once. Kosslyn (2007, p.32) suggests providing a road map, the conceptual structure of the presentation, immediately on one slide and highlighting the single points as the lecture progresses by dimming the other entries. Yates & Orliowski agree: "The typical introduction includes a slide containing a preview of the talk's structure" (2007, p.15).

Slide presentations consisting exclusively of long bulleted lists, with progressive disclosure or not, may be soporific. Consistency is good; but so is variation. Sometimes, series of bulleted lists can be broken with other types of slide content, perhaps a relevant illustration. If such an illustration prevents the audience from dozing off, it is functional. "[A] variety of visuals will keep your audience's interest and attention" (Kosslyn, 2007, p.21).

DEALING WITH DETAILS

A crucial factor in choosing lecture form is the need for discussing detailed visual material. A seminar format may be better when the subject matter and the kinds of material considered are served better by documentation on paper handouts – not prints of slides. This format can possibly be combined with an introductory slide presentation.

What if a slide presentation is the only available option? Practically all authors recognize the limitation of slide presentations for showing such detailed information as tables, formulas, and technical drawings. "it is better to be clear than technical. If presenters are clear, then they may induce audience members to read their written work, which is where technical competence and flair really shine" (Salmond & Smith, 2011, p.592). Presenters can deal with detailed information in at least three ways. Sometimes, a table with many figures for use in a slide presentation can be represented by a simple graph with few details. Sometimes, emphasizing important parts or omitting less important parts can simplify a complicated technical drawing. Sometimes, a complicated technical drawing can be divided into two or more less detailed drawings. "Figures composed of multiple panels should be avoided. Instead, the individual panels should be presented sequentially as separate images" (Anholt, 2006, p.76). "It is important to avoid showing tables. Tables containing rows and columns of numbers are an excellent way to document data in written form, but nobody in the audience can read, compare, and analyse tabulated data points during an oral presentation. Instead, the data should be converted into a bar graph or, if possible, a line drawing..." (Anholt, 2006, p.76). "An unreadable formula is waste of time, even if it is substantively appropriate. This may require showing only the most important or novel part of a formula rather than the whole thing" (Salmond & Smith, 2011, p.592). "One way to

simplify intricate diagrams is to start by showing the basic components and gradually increasing its complexity” (Anholt, 2006, p.89). “The less busy a figure appears, the more justice it does to the information it attempts to communicate” (Anholt, 2006, p.79).

H A N D O U T S

If the subject of a slide presentation is complex and complicated, the lecturer should carefully decide what to present on the slides and what to show on a handout. “It is helpful to provide audience members with at least one mode of information that allows *them* to control the order and pace of learning – unlike slides and unlike talk. Paper handouts for talks will help provide a permanent record for reviews – again unlike projected images and talks” (Tufte, 2003, p.23).

A handout can considerably enhance the benefit of a lecture, which otherwise may be a short-lived experience. A handout can be a complete manuscript, or selected parts. It should, as a rule, not be a deck of printed slides. Slides are produced to support the presenter while talking; they are not stand-alones. Handouts should be distributed after the presentation to avoid competing with the presenter. If the presenter wants to discuss something during the presentation, which can only be shown on paper, distribute the handout at the appropriate time for discussion. There may be exceptions to this rule: “It is often advantageous to make instructional handouts as lecture notes available before the actual talk to give attendees an opportunity to familiarize themselves somewhat with the content of the ‘upcoming attraction’. They will then be able to focus all of their attention on the lecturer without being distracted by the handout.” (Anholt, 2006, p.104).

M A N U S C R I P T

When planning a slide presentation the lecturer should also consider the role of a manuscript. A manuscript for an academic presentation serves several purposes. It lets the presenter prepare what to say, it serves as an aide memoire, it facilitates preparation for repeated presentations, and it may serve as a handout. If strictly necessary, and only then, the lecturer can read loud from the manuscript.

Most presentations are best if the lecturer can say what should be said without reading from a manuscript. Even though the lecturer may sometimes miss a word or two when speaking without reading from a manuscript, the loss is offset by a livelier presentation. Reading from a manuscript reduces contact with the audience. Lecturers who read generally speak in a monotonous tone, too fast, or too low. Carefully prepared cue notes on cards or a mind map may be helpful. Occasional glances will not harm the presentation in the same way that reading from a manuscript does. Using the PowerPoint notes function on the lecturer’s computer screen tends to focus the presenter on the computer screen rather than on

contact with the audience. Slides may serve as prompts, but they should never show a full manuscript to be read from. Prompts should be a nice side effect. Slide presentations are made for the audience, not for the lecturer.

Most of the principles presented in this article draw on the experiences and reflexions of a great number of slide presenters. However sensible, these principles would gain in usability if they were substantiated by robust research. Different kinds of subject matters, different kinds of audiences, and different didactic situations offer a great field for future evidence based research. Well executed and well communicated these research results could affect some of the more than 17 million presentations given every day to 425 million students, not to mention slide presentations outside academia.

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