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Best practice guidelines

## WASP (Write a Scientific Paper): Optimisation of PowerPoint presentations and skills

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## ABSTRACT

Slide show presentations have become integral to the workplace, and PowerPoint is ubiquitous since it ships with the Microsoft Office Suite. However, the increasing sophistication of such software may encourage presenters to privilege form over content. It is possible to apply scientific research from Educational Psychology to slide shows so as to not only avoid this fate but also to optimise presentations. This paper applies several Educational Psychology concepts to PowerPoint, most notably those of Mayer's Multimedia Learning Theory, and will emphasise and demonstrate that the quality of a presentation is dependent on the quality, relevance, and integrity of its content. Slide shows should supplement, and not substitute a presentation. Presenters should avoid prolixity, complexity and gaucheness and strive instead for simplicity, brevity, cogency and clarity.

### 1. Mayer's Multimedia Learning Theory and medical PowerPoint presentations

#### 1.1. Introduction

PowerPoint™ is a presentation tool that was created in 1984, released initially for Apple Macintosh, and later acquired by Microsoft [3]. Presentation software is ubiquitous since the need to showcase ideas in slide shows is omnipresent. PowerPoint is arguably the best known since it is ubiquitous: it ships as a component of the Microsoft™ Office™ Suite.

Researchers are therefore expected to be well versed in PowerPoint in order to communicate their findings as slide shows. The software has grown in sophistication, with the ability to create highly complex presentations, to the extent that exaggerated use of its potential is tantamount to abuse of the software. This has led to widespread criticism of this presentation tool since excessive and outright superfluous bells and whistles bolted on to any presentation inexorably leads to the privileging of format over content. Such presentations may also encourage a forceful style that aids and abets a speaker's ascendancy over a captive audience [21]. Research by educational psychologists is therefore worth consulting in order to avoid such pitfalls while ensuring that the presenter imparts the maximal possible useful information to the audience [12]. Presentations must also be mindful of newspaper article writing theory, to grab the attention of the audience from the outset and keep the attention engaged on the speaker and the presentation's contents [16].

#### 1.2. Multimedia Learning Theory

Richard E. Mayer (1947-) is an American educational psychologist

whose Multimedia Learning Theory is also applicable to slide show presentations since these also comprise a form of multimedia [10]. Mayer's theory has twelve design principles and this paper will apply them to PowerPoint with concrete suggestions that were gleaned through years of participation in the international Write a Scientific Paper (WASP) course, of which the efficient and effective utilisation of PowerPoint is considered an essential core topic [5, 7]. This paper will expand upon a paper that also applied Mayer's Multimedia Learning Theory to slide shows [6].

##### 1.2.1. Mayer's coherence and redundancy principles

The former states that people learn better when extraneous materials (words, pictures and sounds) are excluded. The latter states that people learn more from graphics and narration than from graphics, narration and on screen text. These fundamental principles are often forgotten and are best summed up by these two famous quotes:

- “Less is more” by the renowned architect Ludwig Mies van der Rohe (1886–1969), a founder of the minimalist architecture and design movement [17].
- “Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away”, a quote by Antoine de Saint-Exupéry (1900–1944) a French writer, poet and aviator [18].

In practice, a picture and a few lines of text should suffice as an *aide memoire* for the speaker to make a point. Speakers should minimise text and attempt a word count of up to fifteen words per slide, to not exceed four to five lines per slide, and to use symbols if these can replace words and shorten the total amount text in the slide. A slide show is not a teleprompter and a speaker should never read from the screen unless reading quotes.

Presenters should thus strive to have as few slides as possible. In practice, it is difficult to present more than approximately one slide a minute. Having significantly more slides than this and flicking them past an audience at a fast rate while speaking rapidly will not impart more information but conversely, is likely to lose the audience due to inherent limitations of the human brain with its limited channel capacity. This accedes to the notion of “cognitive load”, referring to the total amount of mental effort being used in the working memory [20].

### 1.2.2. Modality and multimedia principles

The former states that people learn better from graphics and narration than from animation and on-screen text. The latter principle states that people learn better from words and pictures than from words alone. Text and pictures are superior to text alone. This accedes to Dual-Coding theory which states that visual and verbal information are both mentally used to represent information [13]. In summary, in order of preference, one should use graphics and as little text as possible, and animations only if deemed absolutely essential.

### 1.2.3. Segmenting principle

People learn better with user-paced segments rather than as a continuous narration. This is facilitated by the requirement that presentations should always follow the conventional IMRaD format: Introduction – Method – Results – and – Discussion. This format was first formally introduced by Louis Pasteur (1882–1895), the French biologist, microbiologist and chemist who remains renowned for his discoveries in the fields of vaccination, fermentation and pasteurization [14].

### 1.2.4. Signalling principle

People learn better with cues that highlight the organization of the essential material. This principle ties in to the previous in that a presentation in IMRaD format can easily be formatted to highlight the crucial elements of a presentation, which ultimately summarises a research project. Thus, cues should be given to alert the audience to the central elements which are typically results and particularly important conclusions in the discussion. Indeed, presenters should consider the possibility of creating an initial slide that lays out what the entire presentation will be about.

Three further important points arise from these two related principles.

- Presentations should be specifically tailored to the audience at hand. This cannot be emphasised enough: the presentation should be pitched to the audience being addressed and it is the presenter's onus to discover beforehand the nature and level of the audience [2].
- The presentation should also be paced to the audience in that different audiences have different levels and rates of comprehension. For example, a presentation to medical students will be pitched and paced differently if given instead to an audience of seasoned consultants, even if the topic is identical [2].
- Timing is crucial. Overrunning speakers are chairpersons' principal nightmares. Presenters should rehearse and ruthlessly pare presentations to fit their allotted time slot. This is always possible. For example, the paper by Watson and Crick that described the structure of DNA, led to Nobel prizes and has been cited more than 2000 times. However, this paper was just one page long and can ultimately be summarised in one sentence: “the structure of DNA is a double-stranded helix”. If Watson and Crick could do it in a single page, then we all can, without exception [22].

### 1.2.5. Spatial and temporal contiguity principles

The former states that people learn better when corresponding words and pictures are presented near other while the latter and related principle states that people learn better when corresponding words and pictures are presented simultaneously. Again, the complexity of the

information being simultaneously imparted must be pitched to the level of audience at hand.

### 1.2.6. Pre-training principle

People learn better when they are primed with the names and characteristics of the main concepts that are to be addressed. Audiences should therefore be familiarised with the names and characteristics of the main concepts and key terms that the presentation will dwell upon, from the outset, along with what the presentation intends to set out to do: typically demonstrate result/s.

The top priority from the outset is to convince the audience that it is worth paying attention to the speaker by vying for this from the outset and by convincing them that they will not be wasting their time, and that they have an incentive to listen. Throughout the presentation, the main points to be driven across should be used as slide titles, with graphics and/or short bullets as an *aide memoire*, along with the use of summary slides at key points if required as per segmenting principle.

### 1.2.7. Personalization and voice principles

These are related in slide shows in that the former states that people learn better from multimedia lessons when narration is in an informal and conversational style rather than formal style. The latter states that people learn better when narration is spoken in a friendly human voice rather than a machine voice. There are several related points:

- Speakers should be well groomed and attired appropriately. The level of formality of the latter should also be pitched to the occasion and audience at hand. For example, the attire during an informal presentation at a journal club during a break at work is totally different to a presentation at an international conference.
- It is inappropriate and boorish and even rude for a presenter to turn their back to an audience. A comfort monitor is crucial for a presenter to remember the contents of the current slide, which, as already stated, is an *aide memoire* for a speaker to talk from.
- The audience's attention may be better retained if it is possible for the speaker to move around the room, away from the comfort monitor, if space permits.
- For this reason, a remote “clicker” is useful to advance slides and a quick glance at the next slide suffices for an experienced speaker to continue the presentation.
- Since a scientific presentation is not usually read from a script, the presenter may frequently needs to pause to gather his or her thoughts. It is during these moments that speakers may inadvertently utter filler sounds such as “emmm” or “umm” or “aaaaa” or non sequiturs such as the word “basically”, particularly when marshalling thoughts at the commencement of a sentence. These are known as “crutch words” that have null semantic value but over time, become unconscious verbal tics. If a pause is needed, it is perfectly acceptable for the audience to experience a moment of silence. Anything is better than pointless sounds or words that violate the Redundancy Principle.
- Presenters should also be mindful of their paralanguage. This is because while we speak with our voice, we converse with our entire bodies as conversation consists of far more than a simple interchange of spoken words. Paralanguague is defined as the nonlexical component of communication by speech, for example, intonation, pitch and speed of speaking, hesitation noises, gasps, sighs, throat clearing, gestures, and facial expressions, smiles or frowns [1].
- The appropriate use of body language is crucial. Gestures should not be exaggerated and eye contact should roam over the entire audience since this too is a form of nonverbal body language, and constitutes an important sign of confidence and social communication. Indeed, the 7%–38%–55% rule avers that these percentages account for the relative impact of words, tone of voice, and body language respectively, when speaking [11].
- Rehearsal should thus not only fine-tune the duration of the slide

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