Instructional typographies using desktop publishing techniques to produce effective learning and training materials

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I would like to focus our thinking for this session around the area of writing and presenting instructional materials for training and staff development purposes. My attention will therefore be on three aspects:

- Research findings of instructional typographies,
- Implications for trainers and presenters, and
- Examples of alternative presentations for training.

Research findings of instructional typographies

Research in the area of instructional design of training materials is very limited. Research on the design of instructional materials has come from the fields of designing instructional materials for the traditional and formal areas of learning: that is, teaching materials for both adults and children. Writers and researchers such as Hartley, Jonassen, Watts and Nisbett have extended our information in this area. Further information and guidance comes from the recent research in Australia by Colin Wheildon, Managing Editor, NRMA Sydney, and Dr John Hedberg, Associate Professor, Information Technology in Education, University of Wollongong. The relevance of their research and suggestions as it may apply to the areas of training I consider relate to the aspects of:

- page layout
- typeface and type styles
- use of emphasis (bolding, capitals, italics, underlining, reverse type and outlining)
- text alignment and justification
- colour

I will therefore deal with the research from these above areas in relation to their relevance to training materials and training practices.

Page layout research findings

The page layout research for instructional and training texts comes from a number of writers and researchers. The most notable are Hartley (1981), Hartley (1986), Jonassen (1985) and Hedberg (1989).

The recommendations from their research in the area of page layout would appear to be that for the page be considered as two columns, one larger, one smaller. If headers or footers are to be considered, then they would extend from the edge of one column to the edge of the other column, as shown in figure l.
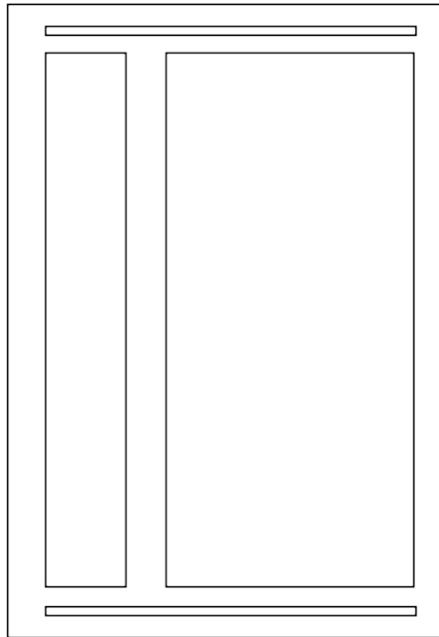

Figure 1: Page layout arrangement

4. Any colour as long as it's black Consider this page. It looks much like any other page, with its ordinary black type printed on ordinary white paper.

Colour the type blue, and imagine how much more attractive the page might become to the reader's eye. If you were to show potential readers the two pages together, the chances are that eight out of 10 would find the blue printed page more attractive than the black one, and that nine out of 10 would probably describe the black page as boring.

But ask those people now to read the two pages, and we're in for a different ball game.

The chances are that seven out of ten who read the black text would display comprehension sound enough to enable them to digest the text and act on any message it contains, but of those who attempted to read the visually more attractive coloured text, only one out of 10 would display good comprehension.

Not a very attractive result you may agree, particularly if the aim of the text is to sell something.

Spot colour can do wonders for advertising revenue. This is unassailable. US research tells us about one advertiser who paid a loading of 70 per cent for spot colour and drew more than 400 per cent more sales. Spot colour generally adds to the cost of an advertisement of 20 percent or more, but the advertisement is noted by 63 per cent more people and results in 64 percent more sales.

What the research doesn't tell us is how the colour was used. One can understand a positive impact when spot colour is used on logotypes and ideograms such as BP, Shell, Ford, the Mitsubishi diamonds, "Coke" and so on, but what about headlines? Or the text?

What's the effect on the reader if the colour is used as part or all of the message, instead of as an ancillary?

Colour imparts a feeling of excitement and most certainly is a magnet for the eyes.

The purpose of these test was to determine if at the same time colour used in headlines or text might impede comprehension - if that magnet might impart a negative influence.

Coloured headlines Most frequent use of colour in headlines is high chroma colour, such as the process colours, cyan and magenta.

Other high chrome colours, such as hot red, bright green and orange are becoming more and more common in newspaper and magazines as run of press colour availability increases.

Tests were made of both high chroma and low chroma colours.

Figure 2: Page 23 Communicating? or just making pretty shapes.

With this arrangement the left hand column would be for headings, major points, prompts or icons if used. The left hand column would be for body text, graphics and tables. All body text graphics and tables would be left aligned.

This layout would appear to contradict the mainstream of practice in having the text cover the whole space between the margins. From the work of Hartley (1987) and others the idea that line-length for instructional material be based upon the concept of "syntactically structured word-strings" as being the determining factor for line-length has been widely accepted by instructional designers. This leads (with a 12 point type) to a choice of an average of 10-12 words to form a line. This results in an line-length of 11-13 ems. This also fits with the line-lengths for the scanning movement of the eye. This length is also supported by Watts and Nisbett (1974) when combining 12 point type and word groupings. Colin Wheildon and John Hedberg also make this point and demonstrate its application in their research presentation. A sample of Colin's layout is indicated in Figure 2.

The line-length should remain unjustified and aligned to the left unless you have it type set with kerning, so that spacing between words remains at a constant spacing. There still remains debate about unjustified and justified text in instructional material, however I believe this debate to be clouded by a matter of look for uniformity, rather than of use to the reader. I am strongly convinced that unjustified text (which removes the need for hyphenated words) to be a more acceptable style for instructional material when it is produced with equipment that cannot kern and maintain constant word spacing.

The application of this principle would appear to have been used in many computer user documentation. Software companies whether knowingly or not have developed user manuals that follow these principles. Software users not happy with one set of documentation would be disinclined to purchase software from the same company again.

Microsoft is one company that has strictly used the two column layout. It also uses within the body of the text, additional prompts that have been explained to the user at the beginning of the manual. Figure 3 illustrates the operational layout as used by Microsoft.

Just a quick word on floating base lines. A floating base line is designed to allow for grouping of information in blocks, rather than separating these to accommodate a particular page break position. This aspect of not separating grouped information in instructional material has been stressed by most writers in the area of instructional design. The result has been that content determines the page breaks and location of the bottom line, rather than having regular page lengths. (Hartley 1987).

g *Glossaries*

≡ *Renaming a glossary entry (Full Menus)*

1. Choose Glossary from the Edit menu.
2. In the list box select the name of the glossary entry you want to rename.
3. Type the new glossary entry name in the Name text box.
4. Click the Define button.

≡ *Deleting a glossary entry (Full Menus)*

1. Choose Glossary from the Edit menu.
2. In the list box, select the glossary entry you want to delete.
3. Choose Cut from the Edit menu.

   Word asks you to confirm that you want to delete the glossary entry. The deleted entry is stored on the Clipboard.

≡ *Closing the Glossary dialog box (Full Menus)*

➤ Click the Cancel button or click in the document window.

NOTE   Clicking the Cancel button does not discard the entry you've defined or delete glossary entries that you have inserted into your document.

≡ *Creating your own glossary (Full Menus)*

1. Choose Glossary from the Edit menu.
2. Choose New from the File menu and click Yes to clear all entries from the list box except Word's default standard glossary entries.
3. Create as many glossary entries as you like.
4. Choose Save As from the File menu
5. Type a name for the glossary in the Save Current Glossary As box
6. Click the Save button

≡ *Saving a glossary (Full Menus)*

When you quit Word and have made changes to a glossary, created a new glossary or merged glossaries, Word displays the Save As dialog box so that you can save the changes.

➤ If you've made changes only to the Standard Glossary, accept Word's proposed response of Standard Glossary as the glossary name in the Save Glossary As box. If you've used New or Open, type a name for the new glossary in the Save

Figure 3: Page 110 *Microsoft Word User's Guide*

The Microsoft manuals use this principle (see figure 3) and the sample page from Colin's work (see figure 2) supports this principle as well.

Typeface and type styles research findings

The next area of consideration is in the area of a serif or sans serif font. Much debate centres around the readability and legibility of both styles of font. The supporters of sans serif font point to the clarity of sans serif fonts as opposed to serif fonts. Yet most studies seem to look at only a small amount of text: that is, word recognition when considering typeface. Sans serif as a large body of text can become very monotonous and I have found and the research of Colin Wheildon supports the fact of readers of instructional material losing their line reference more often. It is the

addition of the serif in a serif font that researchers regard as being of benefit in assisting the readability and legibility of print.

The British Medical Council in 1926 found in their studies that sans serifed type caused what it called irradiation: an optical effect in which space between lines intruded into letters, setting up a form of light-vibration which militated against comfortable reading.

In Colin Wheildon's (1986) tests on the comprehensibility (rather than the legibility) of serif versus sans serif type, sans died a thousand deaths. The percentage of readers who comprehended sans serif body copy well was a miserable 12% and the percentage for serifs was 67%. When asked, those readers who scored badly on the test complained about having had difficulty reading the text. Some said the type strained their eyes and some said they continually had to back-track to regain comprehension.

However, not all serif fonts are as readable as each other. Considering the aspects of the debate and the available DTP technology it has been easy for many writers to be carried away with typefaces and styles that look attractive and different yet do not enhance readability. From the work of Hartley (1987), Jonassen (1985), Spencer (1969) and Tinker (1963) I developed in the Department of School Education a number of guidelines for the choice of standard typefaces on the Macintosh system. The result being that Palatino became the standard font, in 12 pt on 14 pt leading.

The selection of the Palatino font over others available on the Macintosh resulted from a process of eliminating those fonts with less enhancing features than Palatino. Palatino has:

- few idiosyncratic features of the shape of its serifs, as opposed to that of Garamond and Bookman: for example, "g"'s
- consistent spacing of letters within a word, which is not the case with Avant Garde
- no fine lines or strong contrast between thick or thin lines from top to bottom of a letter to cause degradation in the photolithographic or photocopy process, such as often occurs with Times: for example, "f" and "o".
- no letters which appear to touch each other, such as is the case with Bookman's bottom serifs.
- a clear distinction between the "dots" of the i's and the j's with the lower part of the letter, as is not the case with Bookman's serifs and Times' kerned "f"'s and "i"'s.
- italics which show little distortion from 90 degrees in its typeface, as many of the other selections have a tendency to do.
- appropriate word spacing and internal letter spacing that Hartley (1987) indicates should be approximately 25% of the type size. This does not appear to be the case with Bookman or Times on the Macintosh system.

In considering these requirements, it appeared that Palatino satisfied most of the criteria, if not all of them very satisfactorily.

I find support in my conclusions from the work of Colin Wheildon (1986, p19) on the readability of typefaces, ranging from 92% for Roman old style lower case, to sans serif lower case with 86%, to Square serif lower case 64%.

Use of emphasis research findings

When typewriters were the only means of producing low-cost information sheets within the training environment, the only enhancements available for indicating emphasis were the use of CAPITALS and underlining. Italics were later available. However, with the ready availability of desktop publishing and variability of typefaces and typestyles, an unfortunate situation appears to have developed in the production of training materials. The catch-cry appears to be

"Variety is the spice of life"

This concept I believe is the result of transposing the devices used in advertising and the popular magazines used for only immediate impact, to training materials (and other materials) without any understanding of the difference in content or purpose of the different media or even whether they actually work in advertising. Colin Wheildon's research would suggest an enthusiasm for variety and colour from the desks of the graphics artists without much evaluation of their impact on the reader. The unfortunate result for training materials has been that on a page of information there can occur the desire to have as many varieties of typeface and type types as possible. The result from a perspective of comprehending instructional material is disaster. Whether on

- an advertising brochure for a training course,
- overheads used in a training session, or
- session materials or reference materials for further reading.

Capitals

Writing from three separate areas of investigation, Hartley (1986), Hedberg (1986) and Wheildon (1986) indicate strong support for improved reader comprehension when using lower case typestyles for headings and emphasis. Wheildon states "Those who argue for lower case because of its apparently greater legibility have the physiology of reading on their side. When a person reads a line of type, the eye recognises the letters by the shape of their upper half. With lower case this is simple, because the top halves of lower case letters are generally distinctive, and importantly, framed by the white space that surrounds them, permitting easy recognition. Put it in capitals, and the eye is presented with a solid

rectangle, and recognising the words becomes a task instead of a natural process."

When using capitals the word-image shape is not able to be found in the reader's memory pictures in the brain. Research of left and right mode brain functions now confirms the storage of word images and predominantly in lower case as in figure 4. The results of Wheildon's research findings in this area are indicated in figure 5.

DOG

dog

Figure 4: Word images

Legibility of headlines styles

1	Roman old style lower case	92
2	Sans serif lower case	90
3	Roman modern lower case	89
4	Roman old style italic lower case	86
5	Roman modern italics lower case	86
6	Sans serif italics lower case	86
7	Optima lower case	85
8	Optima italic lower case	80
9	Roman modern capitals	71
10	Roman old style capitals	69
11	Square serif lower case	64
12	Roman modern italics capitals	63
13	Roman old style italics capitals	62
14	Sans serif italics capitals	59
15	Optima italics capitals	57
16	Sans serif capitals	57
17	Optima capitals	56

Figure 5: Legibility of headline styles

The conclusion then by researchers who are concerned with reading for understanding and long term comprehension is do not use capital letters for emphasis.

Bolding

Wheildon, Hedberg and Hartley all indicate the reduction in legibility and comprehension with the use of bolded type for groups of words such as sentences and paragraphs. Their reasoning relates to the distortion of the word image and the blurring of one word into another, particularly if the

mechanics of bolding is to offset the bold type as opposed to increasing the amount of ink in relief on the letter or word.

Wheildon concludes:

> The bold text, occupying more of the letter space allocated to it than normal type, seemed to some readers to be cramped. To others it seemed to set up a halo effect, carrying the outline of letters into adjoining letters and on to the lines above and below.

Results were:

Table 17

	Comprehension level		
	Good	Fair	Poor
text printed in Times Roman	70	19	11
text printed in Times Bold	30	20	50

The recommendations would be to use bolded type sparingly having regard to the reduction of comprehension and avoid bolding large numbers of words.

I would recommend the use of bolded type only for highlighting individual words for emphasis or in the need to use embedded commands.

Italics

Italics were seen as a method of adding variety to typestyles on a page of text. Spencer (1969), Tinker (1963) and Wheildon (see figure 5) all provide research evidence that the use of italics greatly reduces the comprehension of any written material. The reason given by all these writers comes back to the degradation of the word image. The research writers such as Spencer (1969), Hartley (1986) and Zachrisson (1965) suggest that the slope of many type styles of italics is so significantly altered from the 90 degrees of normal type that it distorts the shape of the word-image.

I would recommend that italics be used very sparingly and that the only use is for titles of artistic works as indicated in the *Government Style Guide.*

Underlining, reverse type and outline type

Each of these three above methods of obtaining emphasis is strongly not recommended by the research writers. Their basis for such a recommendation is the loss of quality of the word shape. Either by joining all letters together as in underlining, removing the white space around letters and forcing the eye to perform an interpretation of letters as in reverse type or forcing the eyes to interpret from outlined space rather than solid black as in outline, as shown in figure 6.

Figure 6: Effect of typestyle on legibility

All these methods of altering type have the effect of causing fatigue in readers or developing a halo effect, carrying the shape of letters in to adjoining letters and on to adjoining lines. The end result being that there is a significant lose of quality in legibility and long term comprehension.

Text alignment and justification

I would suggest that the line-length should remain aligned to the left and unjustified unless you have it typeset with kerning facilities. Hartley (1986) would support this in his guidelines and demonstrates it in his own writings even though they are typeset. Left aligned text gives the reader the focus for the start of the next line of information and tasks the reader to follow the gravity of information down the page following the Gutenberg Diagram Principle. Centering of text for brochures and overhead transparencies is popular with training professionals. In light of research evidence this would be unproductive in assisting with reader information and comprehension.

Unjustified text enables the spacing between words to remain at a constant spacing. There still remains debate about unjustified and justified text in instructional material. In most training situations facilities which do not have the capacity or the DTP programs to use kerning, unjustified text (which removes the need for hyphened words) tends to be a more acceptable style.

Colour

There has been an explosion in the use by training professionals of coloured text and coloured paper. The use of two colours in the production of overhead transparencies has expanded rapidly. Even the suppliers are advertising that the use of coloured type on coloured acetate sheet is a most attractive way to enhance your presentations.

Wheildon makes some strong comments from his research evidence to indicate that this has a most devastating result on the level of readability. He comments

> Consider this page (black print on white paper). It looks very much like any other page, with its ordinary black type printed on ordinary white paper.

> Colour the type blue, and imagine how much more attractive the page might become to the reader's eye. If you were to show potential readers the

> two pages together, the chances are that eight out of 10 would find the blue printed page more attractive than the black one, and that nine out of 10 would probably describe the black page as boring.
>
> But ask those people now to read the two pages, and we're in for a different ball game .... of those who attempted to read the visually more attractive coloured text, only one out of 10 would display good comprehension ...
>
> Spot colour in advertising can do wonders for sales. Colour imparts a feeling of excitement, and most certainly is a magnet for the eyes.

The effect on the reader when colour is used as part or all of the message instead of an ancillary is to reduce the comprehension dramatically. This decrease becomes more dramatic the further the text moves from the high chrome colour of black and the further the paper moves from the low chrome colour of white.

The guidelines both from Wheildon (1986) and Tinker (1963) would be to remain with the black text and low chrome colours for paper and overhead transparency sheets.

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