

Pedagogic multimedia design and production

Abstract

This paper offers a framework of guidelines for designing multimedia learning systems. These guidelines concentrate on techniques for achieving pedagogic synergy between audio commentary and visual elements. They also include proposals for pedagogically optimum production techniques. The framework derives from the author's experience of producing and appraising multimedia packages, mainly at the UK Open University.

The Design Framework

A multimedia presentation might include video clips containing their own commentary. Screenwriting principles for video clips can be found in Chapter 5 and 6 of Koumi (2006).

However, when the rest of the multimedia presentation also contains an audio commentary, further screenwriting principles are required. The current literature contains only a handful of practicable principles (Koumi, 2005). The framework of such principles in section 4 below is adapted from Koumi (2006, Ch. 8)

This section is preceded by some essential production points, regarding images in section 1 and the development process in sections 2 and 3.

1. The images

The images can be equations, printed text, diagrams, animations, video.

These images could be *pure source material*, which the audio teaches about. For example in:

- a mathematical modelling presentation – slow motion video recording of a vibrating string, showing the shape of the string, frame by frame
- a presentation about evolution – photographs and descriptions of the species and subspecies of finches in the Galapagos islands, as described by Taylor, Sumner and Law (1997)
- a presentation that relates Homer's poems with archeological data – the text of Homer's poems and archeological site plans, as described by Laurillard (1998)

- a presentation describing an Internet Tutorial concerning evaluation of Websites – screenshots of Websites, plus tables of results

In all these cases, the audio could do all the teaching about the visual source material. More likely, the audio would be anchored by succinct on-screen text.

2. How to prepare for the production

2.1 Consider / Specify

- the topic: choose learning tasks for which multimedia presentation is more suited than other available media
- the intended learning outcomes – reappraised and refined as the pedagogic storyline is developed.
- learning context and complementary learning experiences – related knowledge studied recently.
- target audience: age, commitment, previous knowledge gained outside the current course.

2.2 Decide on software

- PowerPoint?
- Macromedia Flash?
- Director™
- Toolbook™

2.3 Decide on type of images

Is video needed? Is full 3D animation needed or will 2D diagrammatic build up suffice?

2.4 Compose an Outline Storyboard, of the multimedia screens, side by side with the narration

A *screen* consists of a sequence of images that builds up on the screen. For example, a title might appear at the top, followed one second later by an equation on the left-hand side (over which the presenter would speak a sentence of narration), then a second equation (with more narration).

2.5 Tape-record a first draft of the audio commentary (the narration)

- Working from the draft of the screen graphics, speak your first draft commentary into a tape recorder (conversationally)

before writing it out as a script. Recording *before* writing ensures that your commentary sounds like *conversational speech*.

- Then listen to the tape and transcribe it
- Then work on the transcript to improve it. But resist reverting to a *written word* style.

2.6 Incorporate feedback from colleagues

Circulate copies of your screen designs to your colleagues (excluding the narration) and make revisions based on their feedback. *To make it easier for your busy colleagues to supply feedback, the screens alone, without the audio narration script, should constitute a full outline of content.*

3. The Production

- 3.1** Schedule script discussions and materials development.
- 3.2** Schedule the recording of the final audio track.
- 3.3** Schedule the rehearsal *before pm of recording day minus one* – to facilitate final alterations.
- 3.4** After the screens are programmed, so that a first draft can be viewed, record the second draft of the audio commentary and lay it onto the audio line of the package.
- 3.5** Programme the graphics build-up so that images appear at particular points on the audio line.
- 3.6** Finalise the screens (this might require several iterations).
- 3.7** Print out the screens (omitting the interim build-up – just showing what each screen looks like finally)
- 3.8** Type the rehearsal script and (later) the final script so that they are easy to read: 7 words per line, 1½-spacing, mark the pauses. End each page at a paragraph ending.
- 3.9** Speaker rehearses, while a colleague formatively evaluates by playing the role of the student (studying printed copies of the *screens* while hearing the speaker).
- 3.10** Record the final sound-track, getting the best out of the speaker, e.g. placing the script on a sloping lectern, record two pages at a time, give frequent encouragement, change the wording if the speaker is having difficulty, take on the role of the student again (to catch slips).

- 3.11 Block-edit first: correctly order all the takes, apart from small re-takes. Then fine edit: tighten pauses, delete paper-shuffles, replace sentences with their retakes.
- 3.12 Digitise the edited sound recording into individual files, one for each screen.
- 3.13 Lay onto the multimedia package audio-line.
- 3.14 Adjust the picture build-up so that it is geared to the new (final) sound-track

4. Pedagogic guidelines for multimedia screen/audio design

Use of language

- 4.1 Long sentences, which normally contain conditional clauses, are difficult to understand. So convert every long sentence into two or more short ones.
- 4.2 Avoid using words that are difficult to say or to hear – for example, where the last consonant of a word is the same as the first consonant of the next word, e.g. the *seventh theme* or, the *last task*
- 4.3 Write *conversational speech*, to be spoken and listened to, *not* sounding as if it is being read from a script (see 2.5).

Layout and build-up of the screen

- 4.4 Maintain a consistent layout between the different types of images. For example, text on the left, video window on the right, equations or diagrams just below the corresponding image.
- 4.5 Students cannot easily process dense visual layout while listening to commentary: the layout should be uncluttered and easy-to-follow. Concerning text, a rule of thumb is to use only 25% of normal print density.
- 4.6 A standard technique is to *develop* a screen line by line, synchronising with the narration.
However, this could irritate students if each line is easy to follow, because they might prefer to **choose** whether or not to read ahead, rather than being forcibly blinkered.

Relationship of screen text to audio commentary (assuming there are diagrams as well as text)

4.7 Why use text at all if the narration is explaining the diagrams?

Some explanation of content could be repeated as text. Such text can serve as visual reference points, which anchor learners' attention and prevent the learner's mind from wandering. They can also serve as visual reminders.

4.8 But avoid too much text. In some multimedia sequences the text duplicates the entire narration. Yet, literate students can read faster than you can speak. So they would process the visual and audio sources asynchronously, causing mutual interference. Both phonological interference and semantic interference. Hence the screen text should précis the narration, rather than duplicate it.

Also, to help students marry the two, the text should *reproduce key words* of the narration rather than *paraphrasing* it. If a screen says "basic ideas", narration should not paraphrase this and say "fundamental notions". Instead the narration should reproduce the key text words "basic" and "ideas". For example, should say "first I'm going to consider the **basics**, that is, the **ideas** that are fundamental to the subject. The narrator's tone of voice can help further by *stressing* these key words.

Reducing the amount of text also reduces the danger that students would miss critical diagram changes while attending to text.

4.9 Item 2.6 recommended designing screens to be a full outline of the topic, sufficient for your busy colleagues to grasp without having to listen through the audio commentary. These colleagues are subject matter experts whose memories may need refreshing, so if the screens are sufficient for them, they should also be sufficient for the students (aspiring experts) when they revise (see 4.26).

You can achieve a full outline with an economic amount of text. This is because the text gains new meaning once students have listened to the commentary

4.10 If you find that it is not possible to make screens sparse enough to be followed during listening to the audio, then you have chosen the wrong medium. Audio commentary can be too difficult to follow and integrate with the images, if either

the images or the learning task are complex enough to require self-paced study. In that case, you should have chosen the print medium. This is the preferred medium when the learning task is complex and requires self-paced, concentrated reflection.

The images and the commentary should reinforce each other

4.11 Indicate clearly where to look on the screen. This often requires a visual cue such as highlighting a part of a diagram when it is mentioned. Alternatively, it may be natural for the narrator to orient the learner's gaze by saying, *at the top of the screen* OR *after the peak of the graph*.

4.12 Highlighting an item when it is mentioned (as above) is an example of the images synchronising with the corresponding words – which is appropriate in many situations.

In contrast, on many occasions, the words should precede or follow the corresponding images, as follows.

4.13 The images should come first whenever students need a visual reference on which to anchor the points in the narration. For example when the images are mathematical expressions that are difficult to listen to unless they can be seen.

4.14 In contrast, there are occasions when the narration should come first, in order to prepare the viewer for the images, such as:

In the next video clip, concentrate on how the ice-skater positions her arms so as to speed up her spin <CLIP STARTS WITH SKATER'S ARMS HELD WIDE, THEN PULLED IN.

4.15 Give students time to perceive the images. For example, give time for their eyes to settle on a new screen before commenting on it.

Educational narrative (judiciously balance structured exposition against independent exploration by the student)

The efficacy of narrative structure has been proposed by many writers, such as Gudmundsdottir (1995), Gibson (1996), Laurillard (1998), Laurillard, Stratford, Luckin, Plowman and Taylor (2000). The guidelines outlined below are examples of design principles for narrative structure.

4.16 Hook: (capture and sustain attention): e.g. capture attention with surprises; sustain attention with suspense.

4.17 Signpost: indicate where the story is going, what is happening next, why it is happening, what to look out for.

4.18 Facilitate concentration: e.g. short pauses for contemplation; encourage prediction.

4.19 Encourage/scaffold constructive learning, e.g.

- spoken words should not be a literal duplication of the images (because you want to encourage students to make the picture-word connection for themselves)
- concretise: that is, relate to (hence *activate*) students' previous knowledge

4.20 Elucidate: maximise clarity, moderate the load, pace and depth.

Regarding load, pace and depth, do *not* overload students with too many teaching points or too fast a pace, or too much intellectual depth. The appropriate teaching load, pace and depth depends on the level and prior knowledge of the students (e.g. regarding depth, deal with the specific before the general, especially for children).

4.21 Texture: e.g. insert occasional light items, vary the format whenever it seems natural to vary the mood, exploit the characteristics of audio, i.e. tone of voice, sequence, pacing, phrasing, timbre, sounds of real-world

4.22 Reinforce: (e.g. give more than one example of a concept, use *comparison* and *contrast*).

4.23 Consolidate learning, e.g. through students solving end-of-chapter problems.

Navigational Guidance and Student Control

4.24 If the multimedia package is on DVD (or CD-ROM) specify in the printed study guidance which DVD to play. Conversely, at the start of the DVD, specify in a screen-text announcement which part of the course goes with the DVD.

4.25 On the DVD, follow the above announcement with a *Contents page* from which learners can access the different sections (normally in whatever order they wish). The *Contents page* should record where students have been, by ticking or highlighting the title of each section that has been accessed.

4.26 When students are re-visiting a *screen*, for revision purposes, they do not always want to listen to the audio track. User

choice of whether to hear the commentary can be achieved by including a *skip* button (next to the *audio-bar*), with which learners can jump to the end of the current audio file. This would also skip past the graphics build-up, jumping straight to the full-screen graphics (see 4.9).

5. CONCLUSION

Given all the above, it should be clear that you cannot design a perfect picture-word presentation with your first draft: you need several draft designs and script discussions.

6. REFERENCES

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