Generating understanding between content experts and multimedia designers: Some pedagogic insights for web design derived from research into a CD-ROM production project

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Flexible leaning entails the use of packages such as CD-ROMs, in addition to and often in tandem with Web-based materials. There is always a need to build pedagogy into these learning media, but the task is not straightforward. This paper offers some insights from a funded research project that investigated precisely this sort of task in relation to the interactions of content and multimedia design experts engaged in the production of a blueprint for an ESL CD-ROM. The paper first outlines the particular project that served as the vehicle for the investigation, and explains the generic applications of the project to education technology more broadly. It then draws on some of the data elicited during the project to focus attention on the ways in which content and multimedia design knowledge can be progressively integrated in order to develop the pedagogic power of a product. It pays particular attention to reciprocal changes in the project's content and multimedia design participants' conceptions of each other's expert knowledge and abilities. It concludes by outlining some arguably generic strategies for formalising such realisations in an educational technology design protocol.

Introduction

Australian universities are focusing more and more on the design and development of flexible learning materials, variously defined (McDonald & Postle, 1999; Guiton, 1999). However, design alone is a complex and time-consuming task. Indeed, in the rush to develop product the necessity for design is often overlooked. Moreover, successful flexible delivery design requires collaboration between content and multimedia experts (Holt & Thompson, 1998). This is because flexible delivery requires the synthesis of content and multimedia knowledge and expertise that is not normally part of face-to-face delivery. The data reported in this paper are derived from a funded research project into flexible delivery (Sinclair & Smith, 2001). The project investigated the interactions of content and multimedia experts engaged in the design of a CD-ROM targeting ESL students preparing for the IELTS English Language Speaking test. The research focused especially on the synthesis of content and multimedia knowledge and expertise in the design process. It sought to document how content and multimedia experts collaborated during the design process.

Application to educational technology

Our research indicates that the differences between teaching language face-to-face and using a multimedia product should not be underestimated. The development of language is by its very nature verbally biased and those who become subject matter experts tend to have a cognitive style that is highly verbal. In contrast, multimedia is a visual medium and its designers are more likely to have a

visual cognitive style. Indeed Riding & Cheema (1991) assert that cognitive/learning styles can be divided up into two unrelated continuums (see Figure 1). When examining the Verbaliser-Imager literature we also find support for these categories from: Paivio (1971), Richardson (1977), Riding (1976), Riding (1981); and Riding (1990).
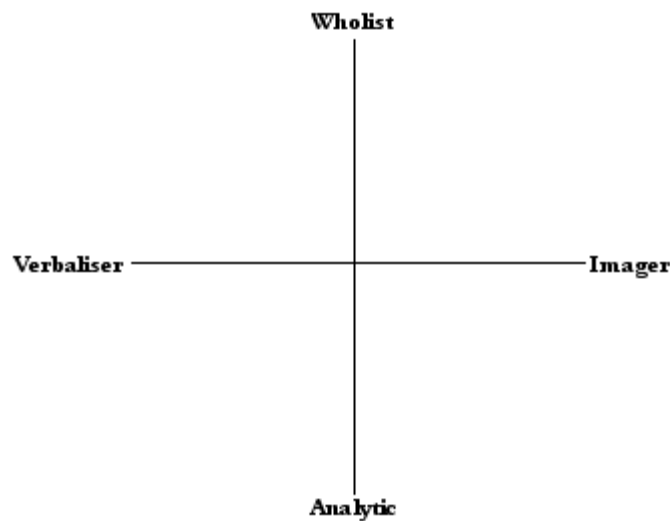

Figure 1: Cognitive Styles
(adapted from Riding & Cheema 1991)

Our research indicates that the horizontal axis of Figure 1 is important to consider when contemplating collaborations between content experts (CEs hereafter) and multimedia design experts (EMD hereafter). To make this point more explicit, we now turn to an analysis of extracts of data that illustrate differences in how design is conceptualised by CEs and EMDs.

Content knowledge and expertise

It is often the case with flexible delivery that students do not interact in a face-to-face way, either with each other or a teacher (Land, 1997; Holt & Thompson, 1998). Thus, a pre-requisite for the design of flexible learning materials is that designers must understand the prior knowledge and skill levels of the learners to whom the materials are directed (Torrisi-Steele & Davis, 2000). In the study reported here one aim of the project was to design a CD-ROM that would prepare ESL background students for the IELTS English Speaking test. Such students come from a variety of non-English speaking backgrounds and have different levels of English speaking proficiency and comprehension, different levels of content knowledge and skill in general terms. The IELTS test targets students' understanding and performance in things such as lexical resource and grammatical range and accuracy. These specialist language concepts are not self-explanatory. In order for our CD-ROM design to progress, then, these concepts had to be understood by the EMD. The extract below is an example of how this process of developing understanding took place:

EMD   Ok so what does lexical resource mean in relation to the test?

CE   It means the breadth of language that the student - the candidate is able to draw on in order to say whatever it is that they have to say

EMD   Ok so when you say breadth of language do you mean breadth of vocab?

CE   Not only vocab well I guess, in a broad sense but not just single words, but appropriate use of phrases and register...

EMD   Ok so that's, what about grammatical range and accuracy? In terms of the test what does

that mean?

CE   Ok so what we'd be looking at is appropriate use of tenses, correct formation of word forms, (PAUSE) word order, correct word order...

In our project the clarification of content occurred in this quite Socratic question/answer format because no pre-existing curricular was used to guide design. Rather, the central concepts driving the design were the language concepts described by the extract above. These concepts were specified as outcomes by the International English Language Testing Service and for this reason they were selected by the CEs and used by them to guide the design. Notice in the extract above that this content component of the design process relies on verbal explanation. In contrast, the extract below shows how more visually oriented ways of discussing teaching led to insight on the part of the CE into the pedagogic differences between CD-ROM and face-to-face modes of delivery:

CE   So sometimes what we might do in the classroom is put four or five sentences on the board and ask them to say which ones are right and which ones are wrong.

EMD   So they can see why?

CE   Even set up pair work which can be recorded where you have a question and answer session and then you go back, listen to it, and think about ways you can improve on it...making the learner aware enough that they can actually pick their own mistakes. Sometimes you get to the point where you say this is a mistake but they have to be able to start recognising things like that in their language themselves.

EMD   Can you recognise...can you see a person who is about to make the transition?

CE   Yes, I think often you can, if you know the students well enough. But it would be more difficult in this sort of situation, wouldn't it? Because you don't know them.

The CE's last three sentences immediately above highlight a crucial pedagogic difference between face-to-face and flexible modes of delivery. Flexible delivery conventionally targets unknown students with whom the designer may never interact in a face-to-face way. Therefore, clarity and meaning cannot simply be added piecemeal as they usually are in face-to-face teaching. Put another way, in the absence of a teacher it is necessary to build directions and instructions (that make the pedagogy explicit) into the design so that the learner can navigate the technical and conceptual dimensions of the learning materials[1].

The following extract of data demonstrates this process of building-in pedagogy. It shows how visualising the combination of a checklist, a mind-map and the progressive addition of information via text and dialogue was used to develop the pedagogic power of the multimedia environment:

CE   ...and we're going to work a little more on the fluency practice activities as well...making some kind of checklist...

EMD   ...with the examples and activities, think about how you would like those portrayed. The examples will probably be the same where you're actually pointing out that the topic is such and such, whatever. The activities are mind mapping, and boxes come up as they start talking about it and they start building the mind-map as they're actually doing the activity.

In comparison with the CE's verbal explanations illustrated by the first extract of data we presented, the EMD's input immediately above invites a visual conceptualisation of the design task. In effect, then, the data thus far presented show how the project participants began to engage with each other's knowledge and expertise, verbal and visual. They additionally point toward multimedia considerations that are themselves just as integral to the process of building instruction, feedback and

conceptual clarity into flexible learning materials design.

Multimedia knowledge and expertise

Our analysis of data indicates that one important factor when considering the multimedia dimension of collaborative flexible learning materials design is that multimedia platforms, methods, techniques and terminology need to be explained and demonstrated to CEs by EMDs *via the use of concrete examples coupled with lay and educational language*. This is because multimedia platforms, methods, techniques and terminology, like content concepts and skills, are not self-explanatory. The two extracts of data below illustrate this point. The first extract involves what seem to be quite self-explanatory multimedia terms that appear to illustrate a design point. In contrast, the second extract gives working examples that demonstrate the practical complexity of the taken-for-granted multimedia terms used in the first extract:

First extract

EMD   ...so you are basically using the movement, the audio and visual stimulus to bring that altogether. Our job is to bring that together in a meaningful way that enhances the learning...

Notice that this extract uses multimedia terminology that is implicit in meaning. In reality, audio and visual stimulus can mean almost anything. Now compare this extract with the one below which involves the EMD explaining how audio and visual stimulus can be brought together. The extract is taken from the EMD's explanation of how a video segment can be incorporated into design.

Second extract

EMD   ...I was thinking of an instance where you could set up a situation where a student is taking the test, you could break that up into a number of portions. You could use a video to show the student coming in, how they would be treated in the test, sitting down and having the rules explained to them and then we might say 'ok - well I'd like you to talk about a particular interest' and then stop it at those particular points and say 'would you choose this, this, or this?' You might take it a little bit further and say 'what would your choice be?' So they can then choose their paths. They might choose a particular path that continues on and they can observe the reactions of the interviewer and the interviewee, in terms of that outcome. So we can do a multi path option.

In contrast with the first extract, this second extract unpacks how multimedia would be used step-by-step and in detail in educational practice. Comparison of the second extract with the first in effect demonstrates that for design purposes the EMDs' verbal descriptions and concrete examples of multimedia capabilities need to be expressed explicitly, in lay and educational terms. The data extract below further illustrates how actually viewing samples of multimedia while simultaneously having technical terminology and capabilities explained by EMDs enhances CEs' understanding of multimedia:

CE   That was really evident in all of the little videos or whatever you want to call them, that you showed us, because not only the introduction gave us a good idea of the sorts of things that we might include and how we might go about it, but seeing those types of animation and having you tell us which are the more complex ones helped us to have a clearer understanding of what sorts of things we might do, taking into account costs and things.

Crucially, once the meaning behind the names of multimedia techniques or methods is operationalised by CEs, they can then visualise ways of conveying their subject matter via multimedia. Multimedia methods and terminology then become analogous to pedagogic tools that

CEs can use to convey the conceptual structure, order and sequence of academic content. In this regard the relationship between making progress in design and synthesising content and multimedia knowledge and expertise, cannot be underestimated.

Synthesising content and multimedia design knowledge

Throughout the first half of this project a major problem was that insight at one level of design in turn generated new difficulties at another level. Put another way, each solution to a problem seemed to generate new problems.

An example of this phenomenon is encapsulated by the two extracts of data below. These extracts highlight the complexities of deciding on content concepts on the one hand and a structure and order for design on the other. The extracts follow on from a session that has been used earlier in this paper to discuss multimedia methods such as Drag and Drop. The first extract demonstrates a conceptual cusp or point of insight on the part of the CE that was reached a third of the way into the project:

First extract

EMD   So the first one is the topic, so you could actually get them to choose the topic and give the students three exercises where they do that. The first one could be sports... and you use a limited number of methodologies in the exercises so that by the time they've run through this first one, then they understand.

CE   and when they hit the next one and it's the same methodology, they'll say I know...

EMD   ...exactly, so Drag and Drop, Tick the Box, we'll probably settle for three probably no more than four as a point to figure out.

CE   that was one of the things that I wasn't quite sure about before, because in this example you give the very first video segment as an example. It was about swimming. But then we were going on to sport? Swimming is a sub topic of sports, and I suddenly thought, hey now just a moment...it wasn't just quite gelling.

At this point the participants in the project seem to have reached a new and shared understanding of the relationship between concepts and sub-concepts and their representation via multimedia. However, the second extract below illustrates a new level of complexity to which this insight gave rise only 30 seconds later:

Second extract

EMD   the teaching points, this is the most important focus of the topic, the key word, number of questions, these are the really important key points. So I'm thinking that you teach that key point and then you give them activities which gives them the different context, give them a sport context, give them a hobby context, give them a general context.

R   so what we're talking about here it seems to me, is either you go sport, 1-2-3-4-5-6,

CE   yeah, that's right.

R   hobbies 1-2-3-4-5-6, or you do activity one, sport, hobby the other.

CE   or, that's, and then is it?... I mean the next step would probably be of too great a magnitude. It would be not only sports, hobbies, general, but interests, work, study, where you live, family...

In this second extract the design choice is at a different level of abstraction to the first because the choice is between ostensibly linear and lateral approaches to developing concept sets and sequences at the level of overall design structure as opposed to the decision exemplified in the first extract. This

relates to simply developing a set of concepts. The design point here is quite profound. Without conceptual structure and cohesion the first half of the project lacked clarity about the relationship between content and technical design. This generated a constant pulse of cognitive dissonance, followed by resolution leading to further dissonance. It was only after a way of integrating content and multimedia concepts in a format comprehensible and acceptable to CEs and the EMD was found, that this situation changed and steady progress was achieved. A big part of this resolution was attributable to the way that project participants progressively understood how each other was conceptualising the task at hand. In other words, once the project participants recognised that they were conceptualising verbally (CEs) and visually (EMD), they were then able to change their approach to design by synthesising their different ways of thinking. Once CEs and EMDs begin to understand each other's areas of expertise they start to merge their knowledge and work collaboratively in the design process.

Pedagogical approach to multimedia design

The pedagogical approach used in the design of this CD-ROM product exploited the audio visual and interactive capabilities of the technology used. Video segments were included to provide a realistic simulation of just what the candidate would experience in the test environment. The design also called for teaching points to be re-enforced with screen text and audio. Clickable text with audio features further added to the learning experience. Interactive tests were included to ensure that candidates understood the teaching points and were able to apply these to new and different contexts.

Animation was used to illustrate concepts and entertain the candidate so that their progression through the learning contained in the CD-ROM product was enjoyable.

Conclusion

This study indicates the importance for design of the synthesis of content and multimedia knowledge and expertise. With initial planning of content and multimedia much of the frustration and seeming lack of progress that characterised the first half of this project would have been somewhat negated. Similarly, following on from such initial planning, the progressive development of shared understanding (in the form of a synthesis of content and multimedia knowledge and expertise) would probably have occurred sooner. An explicit emphasis on the pedagogy achievable in a multimedia environment would have further accelerated the design. Moreover, while it might seem obvious it needs to be said that design is most likely to progress when there is mutual respect between content and multimedia experts. A willingness to share specialist knowledge and expertise is indispensable to any collaborative design process. Thus, the data presented here strongly suggest that the key to developing such collaborations is the boundary between content and multimedia knowledge/expertise. Specifically, design collaborations between content and multimedia experts are likely to be facilitated by encouraging them to demystify their own areas of expertise and to take on board the knowledge and expertise of their design partners. Combining verbal and visual conceptualisations of design is indispensable, and the earlier in the project that this happens the better. Indeed, some prior preparation on the part of each participant, aimed at making their own knowledge and expertise explicit and understandable to others before attempting actual design, would get design collaborations off to a good start.

Endnote

1. This would be less the case in an online situation involving real time communication between students and a teacher/tutor.

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