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Varying the texture: a study of art, learning and multimedia

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Varying the Texture:
A Study of Art, Learning and Multimedia

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Abstract:

Art Explorer is an innovative multimedia system being designed and developed within the Institute of Educational Technology, at The Open University. Based on an analogy to dreams, Art Explorer is structured into several episodes. Each episode is designed to help beginning students of Art History foster personal constructs about paintings and develop a richer understanding of how their perceptions of paintings work.

This discussion focuses on the pedagogic rationale motivating Art Explorer's development and is structured around two strands of a design story. First, it highlights the research behind the design. The reported research is about learners' problems - most specifically about the varying conceptual, perceptual and affective challenges learners face as they begin to study Art History. But, more broadly, it is about the problems faced by learners as they begin academic study and seek to engage with the knowledge and methods of discipline experts.

Secondly, and it is argued, as a second pedagogic priority, the spotlight shifts to multimedia. The discussion tracks design decisions that aim both to exploit the potential of the medium and to match pre-identified learner needs. The ingredients of Art Explorer are described to illustrate some of the rich potential of the medium for negotiating understanding between teacher and learner.

Keywords:

Affect and learning, exploratory learning, feedback, learner needs, interactivity, personal constructs, narrative and episodic structures, reflection.

Interactive components:

Interactive demonstrations of the Art Explorer system are embedded in the Web version of this article (requires the Macromedia Shockwave plug-in, available for most browsers).

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1.   Introduction

There has been considerable interest over the past few years in the teaching potential of multimedia. In the UK, several universities have expressed this interest by collaborating and producing multimedia materials for tertiary level (collegiate) courses in a wide range of disciplines. Here, we describe the development of some multimedia software, called Art Explorer, developed at The Open University. Art Explorer allows users to discover some of the concepts and methods fundamental to a study of Art History. Its major aims are to foster users' personal constructs about paintings and to help them develop a richer understanding of how their perceptions of paintings work. It does so by offering users a world of experience to work in and a variety of reflective challenges.

The focus of this article is design issues. We look at multimedia from a pedagogical perspective and examine the credentials of the medium in the light of pre-identified learning needs. We trace a process in which educational rationale for the use of multimedia and for this particular multimedia design is developed. The discussion is structured to follow two strands of a design story: first, the identification of learner need; second, the unique potential of the medium.

2.   Learner Need

Over the last four years, we have carried out various studies of students' learning experiences. These have been small-scale, qualitative studies aiming to enrich our understanding of the conceptual, perceptual and affective challenges faced by learners studying at The Open University. These studies are part of an on-going project in the Humanities and so far have been applied to four disciplines: Music, Art History, Literature and Philosophy. Each of the studies follows up survey evaluations of two first level introductory courses presented by The Open University. These are interdisciplinary courses that provide students with a sequence of short (three week) introductions to one discipline at a time, followed by an interdisciplinary, period based, case-study.

These questionnaire surveys provide the university with representative evaluation data from its student body about the teaching on offer. The follow-up studies referred to here (the basis for Art Explorer) were carried out with a total of ten students (two or three students per discipline). Each seeks out a more rounded understanding of the survey evaluation data, provides illustrations of the experiences students relate and offers suggestions about future teaching strategy. The methodology and findings of two of these studies are described more fully elsewhere (see Durbridge, 1992; 1994a). In brief however, the issues raised here were uncovered by scrutinising the course materials used by students, looking for any traces of their thinking or other interactions; i.e., any recorded interaction, from marginalia - scribbles and expletives,

comments or 'study notes' on the texts themselves - to any other written materials students produced to forward their understanding. (Note that all these traces were made according to individual need and preference and not imposed by the research design.) These traces formed the basis of our interviews and group discussions. 'Difference' was also deployed to elucidate the problems and challenges students sought to articulate. That is to say, students were required to study two versions of each introduction to a discipline for the purposes of this study (both versions were used at The Open University over time) and used comparisons of these versions to tease out their concerns.

The design of Art Explorer is based upon this research. It seeks to address some of the problems described by beginning students in Art History. In order to better understand the Art Explorer project, it is necessary to learn a little more about students' difficulties. What were they?

2.1   Perceptual/Conceptual

The first problem is common to each of the studies carried out, and will draw upon student quotations related to Music and Literature as well as Art History to broaden out the illustration. The problem is related to 'beginnings'. Of course it is a problem of wider relevance to many disciplines.

It is crucial to fruitful discussions about phenomena like art, music and literature (or indeed phenomena at the focus of any discipline) that those party to the discussion share a perceptual and conceptual framework. While it may ultimately be quite acceptable for them to disagree about their interpretations, they can only discuss issues of form and meaning to any point, or argue their positions, if they understand what each of them is referring to. Where beginners do not see and hear what experts see and hear, in terms of formal arrangements, they can hardly be expected to understand what underpins the expert argument. But helping beginners to begin,

and thus share expert understandings, is quite a problem.

From the teacher's perspective the problem is twofold. First, there is the problem of remembering how it once felt not to be able to see or hear what has now become 'second nature'. Second, how do they help beginners to discern what they (the experts) perceive? Part of the solution may lie in providing learners with a variety of experiences in which they switch readily between top-down and bottom-up approaches (Peck Macdonald, 1989). Put theoretically, this solution means helping learners to develop and articulate their own conceptual framework, one within which percepts can take on shape and form (see for example Pope and Keen, 1981), and providing them with opportunities to probe their developing perceptions (sometimes quite literally) and thereby come to understand them more fully. As I shall go on to illustrate in

section 3.0, we have tried to address this problem (the mutual dependence of percept and concept for meaning) via Art Explorer by focusing on, and exploring the potential of interactivity. The activities it offers seek to foreground the meaningful interplay between our private perceptions (a kind of personal awareness) and our descriptions of those perceptions in language. Richard Gregory has a neat way of assessing this interplay:

> *The private hypotheses of perception and the shared hypotheses of conceptions make up our reality. (Gregory, 1987, p. 610.)*

Learners will often express their angle on such problems quite simply by saying how difficult it is to know 'where to start', or to 'find a way-in' to a work of art. Beginners quite simply lack the resources - the knowledge and experiences - which will direct their listening, reading and their seeing in productive ways.

Here is a quotation from a Literature student in one of our studies:

> *They'd say "look" and I couldn't see…And I didn't know how to work things out - and they didn't help me do it. I mean BITS of it I could see when they said, "have you thought of this?".. but not things I'd ever work out for myself.*

The bold words focus on a key issue for distance teachers: how does one support students' perceptual and conceptual experiences without being there to help negotiate individualised understanding? How useful is it, for example, to offer a few ideas for starters (see Durbridge, 1994a)? Is it more useful to suggest a few *procedural rules*? Students vary in their needs, being both sceptical of rules and yet wanting to be steered in profitable directions. Quotations from literature beginners again illustrate these points.

> Student A prefers no rules:

> *Clearly any interpretation is OK if you can justify it..(but)..I felt they were pretending. They were going to give you a rule book… "there are these things and this is how you set about doing it". And there was almost the implication that there would be the right rhythm or interpretation.*

> Student A's solution? Throw the rule book away:

> *I didn't worry about having to get one particular idea at the end you know and I was so relieved. And I think it was that notion that there was NOTHING. There WASN'T a right or wrong way. I'd been kind of led to believe there was this kind of 'right thing',*

and then he said in a number of places "it's how you respond to something." and then I thought , 'blow it, I'm going to enjoy this',...and read the play to get the story and then all the ideas you need are there in the [teaching] and I didn't go in worrying about things I didn't get at that moment - I just used what did strike home and made me think.

Student B wants 'rules':

I think it is a problem of method I have with literature - if I can't instinctively just know something, I need to be given a procedure to follow to work it out. Like a pre planned escape route from a public building - there if all else fails.

The sorts of thing she couldn't see "instinctively" were formal arrangements. For example the patterns of sound discernible in the rhyme and rhythm of a poem, or the visual patterns in a poem's layout as a sequence of verses. In a novel or a play, the concern would be with larger structures, with chapters and acts for example, and the repetitions and resonances within them that produce patterns of significance for the work as a whole. And of course, because she could not see these things, she was in a poor position to offer any interpretation of them.

Here is a more detailed example, again from literature. Students were asked to compare the same poetry in two forms, a structured poem and an untitled, unstructured prose version:

The Red Wheelbarrow

**so much depends
upon**

**a red wheel
barrow**

**glazed with rain
water**

**beside the white
chickens.**

with:

> **so much depends upon a red wheelbarrow glazed with rain water beside the white chickens.**

Students were asked if anything got lost in the prose version. One student's response was a vigorous scribble alongside the poem:

I think this is a silly choice, a piece of nonsense (pretension). Is this poetry?

while alongside the prose she wrote:

There is nothing to get lost!

It becomes clear from the course materials that the teacher was trying to elicit several points through this alternative layout device:

The prose version loses two aspects of the poem. First, the poem visually isolates and so stresses certain words; and second, the varying line-lengths and spaces between the 'verses' make for a slower reading.

The teacher then asks students what effects they think arise from these stresses and a slower reading and says:

The effect of isolating 'wheel' and 'barrow' is surely to stress the distinct existence of each part of the barrow; and so with 'rain/water' and 'white/chickens'. This effect spreads to the other words so that I find myself also dwelling on 'red' and 'glazed', while the slower reading pace reinforces this fuller attention to each detail of the scene. (Open University, A102, 1986, revised1990, page 21.)

It is worth noting here the student's distaste for the poem. Our research suggests that where students dislike a work of art, (literature or music) it becomes even harder for teachers to support them: it becomes harder to elicit intuitions or guiding concepts that will motivate and sustain substantial enquiry. We think this negativity - this resistance on the part of learners - is likely to be of relevance to other domains. It implicates *feelings* as integral to the process of learning for understanding. Indeed, the part played by affect in a well-rounded concept of understanding should not be underestimated (Durbridge, 1994b). But teachers, especially at university level and in the West, work within an academic tradition that tends to underplay the significance of emotions for cognition. This tradition focuses upon training the mind to develop its 'objective' and rational capabilities and perhaps underuses a valuable tool in the teaching repertoire as a consequence. This is an idea we shall return to when considering the special contributions that multimedia might make to education.

We mentioned earlier a particular difficulty for distant teaching; i.e., conducting a supportive

dialogue with individual students and adapting feedback to match individual student need when you may never meet students face-to-face. We want to draw attention now to a related problem - the problem of imagining how someone is thinking, or feeling, in an attempt to draw them towards your own point of view, or response.

Here is a student describing her feelings when faced with a lengthy written discussion about *The Red Wheelbarrow*. It was a discussion completely at odds with her own experiences

> *I feel manipulated and I think it's going round and round in circles. I'm always suspicious of pretension, and where the blurb they write is more than the actual BIT I get, I get suspicious. I felt they were trying to get across THEIR ideas and show how clever they were.*

We are looking at quite a complex problem here: we have identified conflicting and often shifting student needs and the delicate balance between students wanting to 'know' (to 'get it right', along expert lines) and wanting to find out for themselves and trust their personal `discoveries.

It may help to drive home one part of the need we are describing—the perceptual gap that needs filling between expert and beginner—if we take a different discipline. Here are two examples of 'non-hearing' by a beginning student in Music.

First a brief quotation from a beginner describing her feelings after listening to a short piece of piano music:

> *They completely underestimate what I don't hear! When he said for example about that piece "there is clearly a tune and no less clearly, an element in the texture that is not the tune...there is 'tune and accompaniment'.." I mean I was completely thrown! To me it was ALL a mixed sound - it was ALL 'lovely tune'.*

The second example is about identifying rhythm. The teacher (who is not present but presents these instructions in print) asks students to listen to two short rhythmic items on audio tape and to identify which is grouped in beats of two and which in threes. The instructions 'to count with the beat' are not repeated on the audio-tape itself, students merely hear the music - specified with an 'item number'. If students find this difficult, they are asked to beat out the answer guided by a visual representation of the beat in their printed material. The advice looks like this:

Count with the beat, starting on a strong beat, thus:

1 2   1 2   1 2
S W   S W   S W   *(S = strong, W = weak)*

or

1 2 3   1 2 3
S W W   S W W

You will find yourself forced into the right pattern; do it the other way and it will feel obviously wrong.

One student's response to this was:

> *This is simply just not true for me because it was hard going for me to feel how it was going at all and so I was just at sea with "right" or "wrong". I really need someone here with me, someone doing it with me, it's all hopeless. I can't hear, much less describe, the pattern of the irregular beat. Please ask them to tap it out, or to give us a lead in, or - something.*

We asked this student if she really could tap the rhythm out differently - in contradiction of the expert's expectation. She was more than happy with this idea:

> *Absolutely - no trouble. Since I don't know where to begin I can do anything!*

We want to turn now to Art History students and to mention some further needs - needs particular to a study of paintings. Again, we have this same general "where to begin" problem. Here is a beginner commenting on her difficulties in knowing what there **is** to perceive in paintings, much less how to describe her perceptions:

> *I really don't know where to begin. Unless there's something obvious, like it's got match-stick people in a street perhaps, I wouldn't know what to say. I'd latch onto something striking like it was very splodgy or in vivid colours perhaps...that's my way of identifying paintings to myself. I wouldn't do more than that, I don't know how to do more than that come to that, what else to say or what else that matters.*

Her experience is quite typical for those who lack expertise in front of paintings. We can usually recognise much of the content well enough - people do not find it difficult to see that there is

a painting of a dog, or a place, or of people having a meal, or perhaps just of squiggly lines - but then what else is there to see? And here we touch upon something that is perhaps a special problem for any deeper understanding of paintings: in one sense they are just too easily understood; their surface meaning is on display and readily seen. But the formal relationships discernible to and valued by experts are less easily grasped or put into words. On the psychology of pictorial representation see (Gombrich, 1983).

2.2   Mystique

Another problem our research revealed about studying art relates to 'aura' - the mystique that surrounds those High Art products singled out by a culture to be of special significance and value. There is an awe constructed about these objects which can easily distance lay people from them. High Art paintings, for example, are usually seen only in grand galleries or museums. The buildings themselves tend to constrain critical enquiry into what is on show; they encourage instead a pose of respectful (and often silent) admiration. Learners in this context need to be encouraged to begin their studies with down-to-earth strategies: they need 'to be allowed' to use everyday concepts to lead their perceptions.

Learning problems related to students' perceptual repertoire (section 2.1) and to the 'mystique' that silences them lead to a further point. It is not always the case that students simply 'do not perceive' - and need merely to be helped to see. Rather, they may be 'resistant' to particular ideas or ways of perceiving. Students come to their learning with a wealth of experience behind them; some of these experiences become cultivated and protected habits of 'non-perceiving'. Thus there is a need for teaching not merely 'to show' students new ways of perceiving, but to dislodge prior 'anti-perceiving' beliefs and behaviours. For further discussion of this issue with reference to multimedia and the role of imagination as a catalyst for learning, or 'new perceiving' see Durbridge (1996).

This idea is returned to later (in section 3.3) where the discussion will be of two everyday concepts that are a major focus of Art Explorer: making and function. The idea of 'making' for example (a familiar idea and an everyday experience) is transferred to students' experiences of paintings. As we shall see, users of Art Explorer are able to unpick the ingredients in a Work of Art. So a product more typically experienced as a seamless whole, somehow 'magicked' out of the ether by a genius, can be newly experienced as something 'crafted'. The idea of craft and the related notion that works of art are produced as the result of deliberate choices and decisions (often related to the material circumstances of the day) is crucial to an understanding of art historical method. So one way Art Explorer seeks to tackle 'mystique' is by enabling students to get their hands on a new (crafty) way of thinking about art objects.

2.3   Mismatch in Expectations of a Discipline

A further area of concern revealed by this research relates to students' expectations of a discipline. Understanding can be impeded when there is a mismatch between learners' expectations of a subject and the course teaching, (the expert view of the subject matter). For example we know that Art History students expect to do quite a lot of work with pictures - directly addressing the objects themselves, learning how to enjoy them and judge them, as well as learning about the artists.

Here for example, is a student talking about an OU television programme:

> *...but that programme on Constable - a very interesting and helpful programme. It did what I wanted the units to do more of and that was to look at paintings and explain how they were put together and why. Teaching analytical skills if you will, which is what I wanted.*

Modern discipline experts however place the emphasis differently; they stress words rather than images when describing their practice. Here, taken from an OU Introductory course in Art History, is one scholar's view:

> **Art history is an academic discipline conducted like other arts disciplines entirely through reading, writing and speaking, verbal discourse.**
>
> **Intellectual processes and verbal discourse are as fundamental to the study of art as is visual pleasure.**
>
> **Confronting an original work of art is not necessarily a more rewarding experience than that you would get from a book.**

Students in our study were very disconcerted by this emphasis: they hadn't expected it, and felt that in some perverse way experts were down-playing the jewel in the discipline's crown - the art objects themselves.

2.4   Abstractness

The student discomfiture just mentioned, links to the next point: the need to help students manage the abstractness of much academic discourse. The focus of modern Art History, for example, is upon abstractions and relationships between them, rather than concrete objects. A recent writer describes modern Art History as about:

the made image as a register of broad social, ideological and psychological structures (Fernie, 1995)

This is a sophisticated project and, as beginning students have pointed out, very hard to get to grips with if you are unfamiliar with ways of analysing the evidence behind the discourse. Here, for example is a student voicing her concern:

How can people possibly do this stuff until they have learned how to look? What they need is practice. Why doesn't the OU send out nice kits for us to play with like they do in the Sciences. All students need are some suggestions - do a bit of tracing like the Victorians did. What's wrong with that?

And again:

Unless you do something to really make you look hard you just don't see or begin to grasp the magic that close looking can really reveal, I mean you can't begin to see and enjoy the economy of brush work of some artists' work, amazing. Look here for instance, so little put in but enough to make illusion a reality.

She makes it clear that asking beginners to understand highly abstract propositions about abstract relationships (relationships between 'registers' and 'structures' for example) is an inappropriate first step from their perspective. Discussions of this sort tend to work at a rhetorical level but are experienced as rather empty rhetoric by beginners who have nothing concrete to refer back to.

2.5   Aridity

The last quotation brings out another common learner need: a need for fun in studying. Learners need experiences which are engaging and motivating and which convey a committing sense of why effort after understanding might be of long-term worth. Here is a literature student echoing her Art History colleague:

If there was more enjoyment, a sense of exploration and discovery in the beginning, it might encourage, it would have been so much more pleasurable.

For further discussion of motivation and on the value of fun in learning see Lepper *et al.* (1993), Lepper and Malone (1987), and Malone and Lepper (1987).

2.6   Summary

In this section, we explored the origins of Art Explorer by identifying a range of problems that beginning students describe as they embark on tertiary level study. We have called these difficulties 'learner needs' in an attempt to focus primary attention upon the teaching tasks that need performing, not upon the technologies that might be used to execute them. We mentioned students' perceptual and conceptual needs; the way that beginners' expectations of a particular subject-matter were misdirected; and, the mystique surrounding High Art and how this tended to exacerbate beginners' cognitive distance from art objects. We commented on the need for fun in learning, claiming that fun was both motivational and value-laden.

It might be argued that these sorts of difficulties are peculiar to distance teaching institutions. But this does not appear to be the case. For example the work by Mitchell on argument, and on the role and type of questioning in face-to-face teaching raise comparable issues (Mitchell 1994).

3.   Multimedia – Design Issues

The Open University has a long tradition of mixing a multiplicity of media - video, text and audio - in its courses. In this context multimedia has to justify its place on good pedagogic grounds and show itself able to make a valuable contribution to learner experience that is not readily achieved in easier or cheaper ways. This challenge became a ground rule for the design of Art Explorer. The program's roots lie in the constructionist ideal where learners' own pre-conceptions are drawn in and built on (Papert, 1980). Providing ways to incorporate and expand the learner's own experiences was one of the key factors in the design of Art Explorer.

3.1 Multiple Learning Textures

A brief review of Art History students' difficulties focused upon learners' need for a shifting texture: i.e., a variety of experiences to support their shifting understanding. Beginners in a discipline clearly need opportunities to participate in both top down and bottom up events; they need a judicious mixture of guidance and free play, a mix of expert 'showing', personal discovery and reflection. We also showed that learners need concrete experiences that are fun to carry out, but that their fun must have a point to it. Multimedia can offer education 'multiple' learning textures - so we should design Art Explorer so as to exploit this potential.

This focus on 'learning textures' is a deliberate shift in emphasis; it moves the spotlight away from the technology, away from multiplicities of *media* per se and away from the sheer capacity of the medium to deliver vast quantities of data to users. Nor is the spotlight upon the expert

as mediator. Instead the design focus falls very sharply upon the user and her activities. The design task becomes one of imagining the variety of experiences one might offer, imagining how these experiences would feel to different users and constructing a variety of means through which one might support these experiences. We became focused that is, upon the qualia of learning (Warburton, 1992, pp. 107-8).

3.2   Defining the Stucture – A New Analogy

A crucial design problem was deciding how to structure this multiplicity of experiences. Multimedia does not lend itself to a strong linear design - the sense of story that underpins the meaning-structure of traditional 'telling'. As Stratfold has demonstrated, it is inappropriate simply to port a narrative video sequence onto multimedia - the narrative gets lost in a multimedia world that is non-sequential in use (Stratfold, 1994).

The design of Art Explorer required a new analogy. Instead of a story we have invoked the analogy of a dream to provide an image for the way Art Explorer works. It is a metaphor for users' experiences of the structure: it is intended to capture the notion of a sequence of discrete happenings whose meaning is highly personal and intrinsic to experience. There are three features behind the design of Art Explorer that a comparison with dreams may help to illuminate. Each bears upon the delicate relationship between structure, meaning and use.

First, Art Explorer is episodic in structure; that is, it consists of, and the user ultimately circles round, vivid individual events - activities that one might call 'unitary hotspots'. Second these events are, as it were, dreamed by users, thus their meaning is personal and individual, revealed through the experience and dependant on prior experience. Thirdly, the analogy suggests some level of interconnection: taken together, the events will provide users with a dream, something they will understand as a unified and coherent whole. To an outsider however, the connections between episodes might, as in many dreams, look tenuous, even arbitrary. It is quite common, we think, to be surprised (if we try, on waking, to recount our dreams) at the disorderly nature of the 'orderly story' of our immediate dream experience. This re-telling can uncover puzzling fractures in the narrative and ones that breach tradition (Hawthorne, 1987).

The dream image forms part of our argument for the design of Art Explorer: it seeks to convey how and why we chose to not rely on a linear structure for the ingredients on offer. The program seeks neither to tell a story, nor impose an expert viewpoint through a prescriptive sequence of use. It seeks instead to exploit the non-sequential character of multimedia to involve users directly in making sense of their own activities.

3.3   Episode Design: The Ingredients of Art Explorer

There are four major episodes in Art Explorer. Within each there are differently textured experiences that aim to encourage users to look closely at paintings and to reflect on their discoveries. Note how this wording - *experiences which aim -* juxtaposes the world of private (learner) experience with expert (teacher) aim or purpose. This tension is a crucial one: it embodies the way we have exploited the educational potential of multimedia to bridge learner and teacher worlds. Reflecting back on our earlier analogy, one might ask "whose dream?" - for both 'sides' have a determining part to play in the understandings enactable in Art Explorer (Bruner, 1986). Also we might consider the role of imagination in revealing, and persuading a beginner of, the possibility of the expert's world view (Durbridge, 1996). In what follows, we shall briefly outline the ingredients of Art Explorer and thus describe some of the ways in which the teaching participates in, and nourishes learner 'dreams'.

All instructions are spoken and animated: audio is supported by visual sequences which simulate the activity described. One general principle of Art Explorer's design was that it should use minimal text. It is widely agreed that electronic screens are poor facilitators of reading for understanding. Nevertheless Art Explorer displays the occasional phrase or word where these serve a useful function, and it stores for reference a 'hidden page' of text which contains the (spoken) introduction and aims for each section. There is also a Navigator - a visual aid that performs an important 'narrator' function in Art Explorer: it shows users where they are within each episode, where they have been, and signals that there are more ingredients on offer (on 'narrative and media,' see Plowman, 1994).

Episode 1 centres on students' need to develop their own ideas, their personal constructs, as they look at paintings. Beginners in the field need concepts to lead their perceptions; they need moreover to develop concepts to which they can relate with confidence. In academic discourse they need to be able to articulate their own viewpoint and use these articulations as a basis for recognising alternative perspectives.

We use multimedia firstly to challenge or coax users into expressing their own ideas. Students are asked to look at 12 paintings and to type in single words or short phrases that describe individual features in them (Figure 1). Users are free to type in what they will, but often have to look quite hard if they are to produce more than a few words about any one painting.
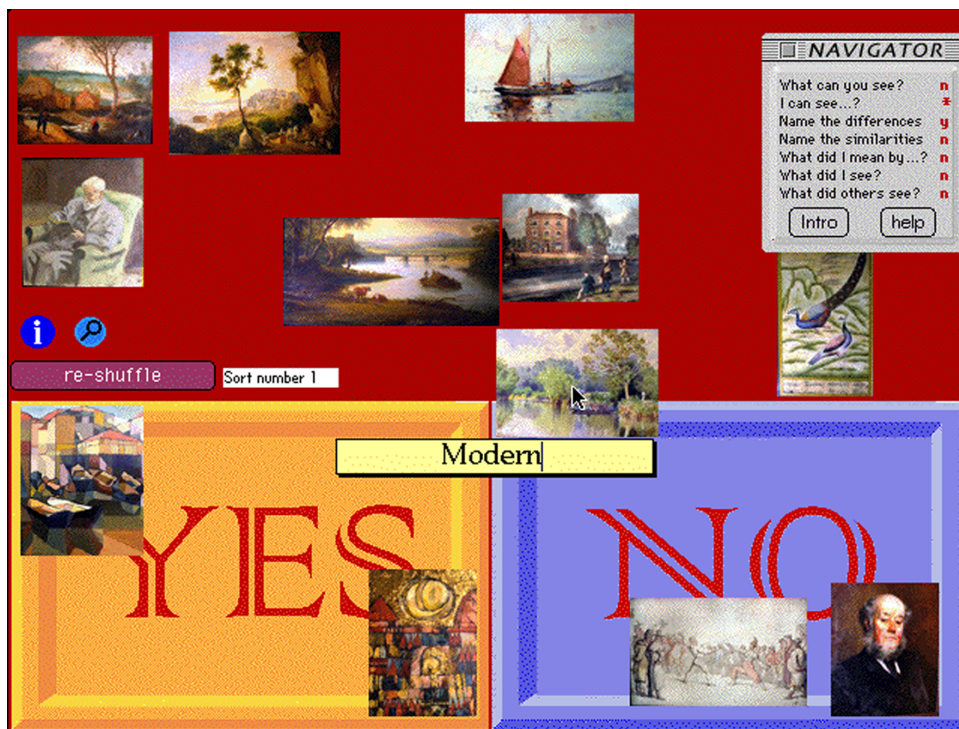
Figure 1: *'Episode 1' in Art Explorer coaxes users into expressing their own ideas by having them sort paintings according to categories of their own choosing. The user here has chosen the category 'Modern' and is sorting the paintings appropriately.*

After this, the computer comes into play: it has been storing users' words of description and analysing them in various ways. These data are now used to challenge users to elaborate and refine their own concepts and to re-examine the paintings (Figure 2). Thus as they proceed students are given various activities which aim to push them to reflect upon their own work and to profit from their experiences; for example, to develop more robust categories for looking at and discriminating between paintings (on 'reflection', see Boud et al., 1985). To vary the learning texture yet further and to offer students another point of view, previous users' words about the paintings on Art Explorer are also stored and available for comparison.

Figure 2: *Episode 1 then challenges users to elaborate and refine their own concepts, and to re-examine the paintings. Here the user is shown an analysis of the ways that they had categorised the paintings.*

Episode 2 is more dramatic. A large part of its texture consists in surprising viewers with what they can do and in encouraging them to be curious about what they can see. It thus has a strong 'play' element that is designed to be fun as well as attention-grabbing and thought-provoking. The paintings in this section are 'live'; that is parts within them can be moved or changed in various ways by the user. Parts can be moved both within and across paintings and users can change the size and axis of various ingredients (Figure 3). Again, as in Episode 1, it would not have been possible for users to do these things, or for them to be the focus of attention via traditional teaching media.

Figure 3: '*Episode 2' in Art Explorer. The paintings in this section are 'live'; that is parts within them can be moved or changed in various ways by the user. Parts can be moved both within and across paintings and users can change the size and axis of various ingredients to experience for themselves the results of altering the painting. [An interactive demonstration from Episode 2 is available in the Web version of this article]*

A number of thematically linked sequences build out of this free experimentation. Users are given a range of visual puzzles to solve which require them to look increasingly closely at details as they change the paintings' appearance in various ways. To solve the puzzles, learners need to consider the different ways artists have handled the ingredients at their disposal. Thus learners are drawn gradually towards thinking about paintings as *made* objects, rather than as mysterious phenomena, and gradually self-discovery blends with guided discovery. The emphasis throughout Art Explorer is on user activity, but perhaps this sequence - where learners experiment with their visual understanding by manipulating their perceptions - is particularly vivid. It demonstrates one way in which multimedia can act as a dynamic intermediary between expert and beginner. In this example, the mediation resides in learner activity: the feedback beginners receive is meaningful because it is intrinsic to their own actions. The teacher or expert

viewpoint is also implicated since their perspectives are reflected in the environment cosseting the student activity.

Episode 3 links closely with Episode 2 but pursues its theme in a more disciplined way. Thus users continue to work with the basic idea that a painting is a made object, but are supported more firmly as they examine this premise. Again the emphasis is on interactive tasks, but this time users are guided very carefully towards an expert understanding of some of the ways in which paintings work their effects. For example, users may experiment with flat shapes and try to work out how to arrange these flat shapes to suggest volume. Alternatively, they can manipulate a table - rendered in three dimensions and animated via QuickTime® video - so as to experiment with 'eye-level' and perspectives. In each case, users' experiences are related back to particular paintings - exemplars of the perceptual point (Figure 4). The aim is to exploit multimedia to help users understand their perceptions more fully by directly 'handling' them (Gregory, 1987).
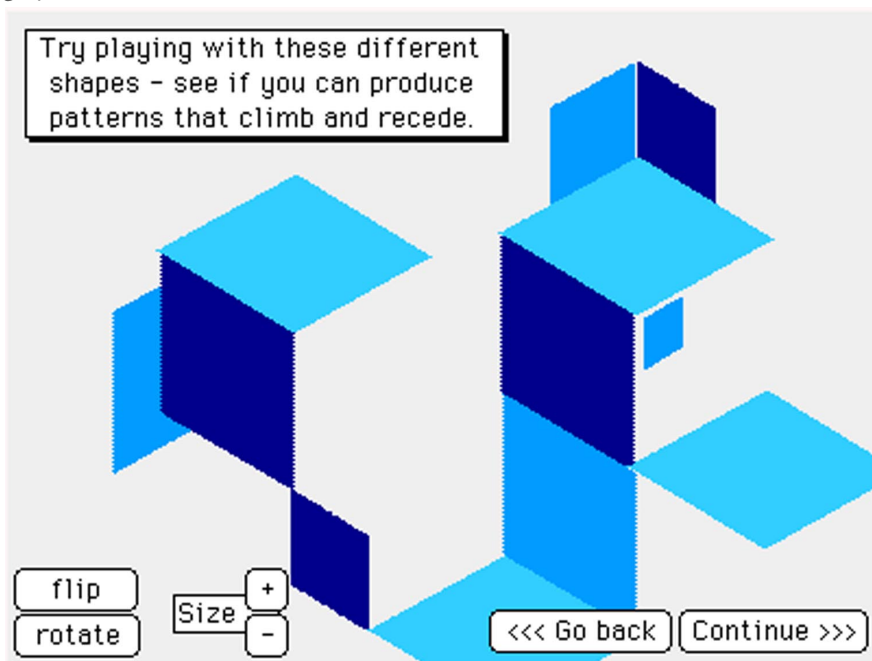

Figure 4: *'Episode 3' in Art Explorer. Users are guided towards an expert understanding of some of the ways in which paintings work their effects by being allowed to manipulate elements. In the example shown, users are asked to rearrange increasingly complex sets of flat blue pieces to create three-dimensional cube textures. [An interactive demonstration from Episode 3 is available in the Web version of this article]*

Finally, Episode 4 takes students to another practical issue: the notion of function. Users are provided with various ingredients (flowers, people, some background and so on) and invited to build these into a design for their own painting (Figure 5). However the painting they construct has to serve a function, and users are given a choice of commissions (e.g. an advertisement or an illustration of a proverb). This practical task re-invokes many of the 'illusionary' issues raised in earlier episodes but requires an engagement with the problem of how to achieve the desired illusionary and emotional effect and meet the demands of a commission.

Figure 5: *'Episode 4' in Art Explorer. Users are provided with various ingredients (flowers, people, some background and so on) and invited to build these into a design for their own painting. The painting they construct has to serve a function, and users are given a choice of commissions (e.g. an advertisement or an illustration of a proverb). The user here has illustrated the proverb 'Pride comes before a fall'.*

4.   Conclusions

The design of Art Explorer began and ended with students in mind and we see this as a major

strength. We are convinced that the most fruitful 'way in' to designing for educational multimedia (indeed to designing any educational materials) is by concentrating on a teaching need. The weak route in, by way of contrast, consists in seeking a design that focuses on the technology.

It was with students' needs in mind that we were able to invent the experiences we wanted to offer them. And it was with the variety of their possible interactions in mind that we developed as many ways of supporting these as we did. The potential of multimedia to 'attack' one nucleus of closely interrelated problems in multiple ways has proven particularly exciting. Some of the richness of the medium is seen in Art Explorer. For example, in the way it offers users experiences with different moods, each of them involving and committing in different ways; so laughter and surprises nudge up against some quite serious thinking. There are too the different interactive strategies deployed for negotiating solid understandings about the experiences on offer: for example, meanings that begin and inhere in one kind of activity are elaborated through others; learners are offered the ingredients for testing out expert ideas - rather than given them as articles of faith; learners work actively with words as well as with events and, as they do either, act in varying degrees of dependence with their teacher. Finally one might point to the potential of the media mix to support exploratory learning: the way that audio and visual data are used together to mutual clarification and enrichment; the ways in which animations are used to supplant direct experience, to clarify abstract propositions and to attract attention; the invaluable contribution made by the computer in diagnosing learner activity and providing feedback that is personally meaningful.

Art Explorer offers multimedia design theory a concrete demonstration challenging common assumptions about the ways in which multimedia can work. The Art Explorer exemplar has been a success: the Arts Faculty at The Open University is investing in its ideas by having a version programmed for use by students. The first episode is being turned into a shell so that different content may be used for other subject domains - there are Arts, Education and Sciences courses wanting to use it. Feedback from the many parties interested in Art Explorer have shown that it is recognised as providing a level of interaction with users' conceptions and experiences that has not been seen in many interactive multimedia programs to date.

Picking its way through the earlier discussions of learners' difficulties was a connecting thread of concern: the way that 'high language' (academic discourse, authoritarian language, poetic language) went hand-in-hand with 'high content' (Art, Literature). The difficulties here were double-edged: students were distanced from their expert teachers in terms both of content (different conceptual and perceptual repertoires) and form (means of approach). This combination also served to distance students further in social terms: students were perforce silent, ("I can't hear much less describe..." ; "I don't know where to begin..."), and silenced by

the discourse ("I feel manipulated..."). Art Explorer aimed to bridge each of these gaps.

As we hoped to illustrate, Art Explorer sought to do so by giving students more of a voice and the means of being heard and answered. For example, the whole sequence in Episode 1 pivots round students' own words and ideas: metaphorically speaking it is their speech that is listened to before the teachers', it leads the discussion that ensues. Taking another tack, in Episode 2, students can 'challenge' received wisdom about the elements in a composition and their function - by direct re-construction and looking at the differences this brings about. In these ways, Art Explorer is also concerned with supporting students as they develop their own language for describing what they see in paintings. It aims to relate these student-owned ideas in fruitful ways to some of the organising ideas that constitute the discipline and discourse of Art History. For example, Episode 3 introduces learners through various activities to the means of artistic representation; Episode 2 (via the potential for mixing and matching ingredients of different paintings) foregrounds the notions of composition and genre. In sum, Art Explorer offers an experiential grounding in some of the ideas that matter for Art History.

It is evident that multimedia allows the world of private percept to conjoin with that of public concept in rich and varied ways; in this respect it is well-suited to many of the scenarios that interest educators in their role as negotiators of understanding. the Syrian leadership had dislodged the real Aoun using their airforce. Of course, these isolated examples do not demonstrate a general predictive capability, but the simulations invariably play themselves out in a manner which is consistent with the prevailing politics of the Middle East.

References

Boud, D., Cohen, R. and Walker, D. (1985). (Eds.), *Useful Experience for Learning*. Nicholson Publishing Co.: New York.

Bruner, J. (1986). *Actual Minds, Possible Worlds*. Harvard University Press: London.

Durbridge, N. (1992). *A214: Developmental Feedback*. TCC Report No. 81, Institute of Educational Technology, The Open University, U.K.

Durbridge, N. (1994a). *Beginning Art History: A Case-Study in Student Learning*. HERG Report No. 17, Institute of Educational Technology, The Open University, U.K.

Durbridge, N. (1994b). *Confectionary: Or the Romance of the Word*. PLUM Paper No. 46, Institute of Educational Technology, The Open University, U.K.

Durbridge, N. (1996). *The Interactive World of Art Explorer*. Innovation in Education and Training International, 33 (1), 30-40.

Fernie, E., (1995). *Art History and its Methods: A Critical Anthology*. Phaidon Press: London.

Gombrich, E.H. (1983). *Art and Illusion*. Phaidon Press: Oxford.

Gregory R. (1987). *The Oxford Companion to the Mind*. Oxford University Press: Oxford. Hawthorne, J. (1987). *Unlocking the Text: Fundamental Issues in Literary Theory.* Edward Arnold: London.

Peck Macdonald, S. (1989). *Data Driven and Conceptually Driven Academic Discourse*. Written Communication, 6 (4), 411-435.

Lepper, M.R., Woolverton, M., Mumme, D. and Gurtner, J. (1993). *Motivational Techniques of Expert Human Tutors: Lessons for the Design of Computer-Based Tutors*. In: S.P. Lajoie and S.J. Derry (Eds.), Computers as Cognitive Tools. Lawrence Erlbaum Associates: Hillsdale, NJ.

Lepper, M.R. and Malone, T. (1987). I*ntrinsic Motivation and Instructional Effectiveness in Computer-Based Education*. In: R. Snow and M. Farr. (Eds.), Aptitude, Learning and Instruction: Conative and Affective Process Analyses, 255-286. Lawrence Erlbaum Associates: Hillsdale, NJ.

Malone, T. and Lepper, M.R. (1987). *Making Learning Fun*. In: R. Snow and M. Farr. (Eds.), Aptitude, Learning and Instruction: Conative and Affective Process Analyses, 223-253. Lawrence Erlbaum Associates: Hillsdale, NJ.

Mitchell, S. (1994). *The Teaching and Learning of Argument in Sixth Forms and Higher Education*. University of Hull: School of Education.

Papert, S. (1980). *Mindstorms: Children, Computers, and Powerful Ideas*. Harvester Press: Brighton, U.K.

Plowman, L. (1994). *Erzaelung, Linearitaet, und Interaktivitaet in Lernvideos*. Zeitschrift fur Semiotik (Special Issue on Semiotic Methods in Interface and Hypermedia Design), 6 (1), 11 27.

Pope, M. and Keen, T. (1981). *Personal Construct Psychology and Education*. Academic Press: London.

Stratfold, M.P. (1994). *Investigation into the Design of Educational Multimedia: Video, Interactivity and Narrative.* Doctoral Thesis, Institute of Educational Technology, The Open University, U.K.

The Open University (1986, revised 1990). *An Arts Foundation Course: A102.* The Open University, U.K.

Warburton, N. (1992). *Philosophy: The Basics.* Routledge: London.