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Audiences' judgements of speakers who use multimedia as a presentation aid: a contribution to training and assessment

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Abstract

Multimedia technology in principle may help speakers to deliver more effective presentations. The present study examined what effectiveness might mean in terms of audience reaction. Understanding that may help educators to use multimedia more effectively themselves and to help their students to do so. Descriptors were elicited from audiences in response to a total of 56 live presentations in which speakers used multimedia as a presentation aid. Forty-two rating scales were defined. A total of 20 presentations were rated using the scales, with the scales presented in one of two different random orders. The order did not appear to affect the ratings. A factor analysis suggests that three factors may be most important in describing the audiences' responses. The first describes audience assessment of how well researched and informative the presentation seemed. The second concerns the design of the multimedia, including how creative and imaginative it was. The third reflects how entertaining and how much fun the audience felt the experience as a whole to be. The results suggest a three-factor model that might be useful when designing multimedia-supported presentations, for providing proactive guidance and feedback when training speakers, and for assessment purposes.

Introduction

Speaking to an audience is an important part of the work of lecturers and teachers. It is also an important feature of the occupations that many of their students will be entering, and those students need to learn the skills involved. Making presentations at a business meeting, an exhibition, a conference, or other event are common examples. A survey by The Aziz Corporation (Aziz, 1998) found that almost a quarter of the company directors surveyed gave a formal presentation to clients at least once a week on average, suggesting the importance of the skills involved. The majority of the survey

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respondents believed that communication skills were more important for career success than intelligence or financial aptitude.

Presentations can often be more effective if they are supported by presentation aids, and the use of such aids is standard practice in educational and business contexts. For some time now (see Baines, 1994; Bull, Christie & Collyer, 1995; Marks, Penson, Maller, Nielsen & deKernion, 1997), traditional presentation aids, such as overhead projection materials, have been giving way to more modern aids, including the use of multimedia. Multimedia offers many possibilities for enriching the communication between the speaker and the audience compared with traditional aids. Despite this, it has been a relatively underresearched area compared with the use of multimedia where students or others interact directly with a multimedia computer or network (cf. Webster & Ho, 1997).

Presentation packages running on personal computers (PCs) are nowadays often used to generate the equivalent of slides or overhead projection acetates. However, modern PCs and overhead projection systems can do much more than that. They allow for more ambitious use of sound and vision in support of the person speaking. Increasingly, speakers are able to use full multimedia. An interesting question that arises in connection with this is what Webster and Ho (1997) refer to as audience engagement. They argue that multimedia in principle provides opportunities for increasing the engagement of the audience with what is being presented to them. In business, that could mean engaging those present at a particular meeting with what is being presented, engaging those visiting a stand at an exhibition, or engaging other types of audiences in other contexts. In the educational context, it means increasing learners' engagement with what the lecturer, visiting speaker, or other presenter is aiming to get across to them. It is entirely consistent with Hawkridge's (1999, p. 300) encouragement to educational technologists to "develop systems for teaching and learning that match the opportunities offered by the hardware and software of modern computers and telecommunications."

The use of modern multimedia systems to support communication in the lecture room, especially if used in conjunction with some conventional modes of communication, would be consistent with the "blended learning" approach advocated by Khine and Lourdusamy (2003). In addition, multimedia could also have relevance to what Nolan (2002, p. 156) refers to as the third generation of distance learning: two-way mediated communication between students and tutors (and others) using many types of media. Today's precursors of such systems (see, for example, Khine and Lourdusamy, 2003, and Rekkedal, 2003) incorporate some relevant elements (such as interactive multimedia and online discussion) but typically fail to exploit the full range of media now available, including audio and video. Shephard (2003) discusses a variety of innovative possibilities for combining different elements, as well as how they might be used in conjunction with streaming video. He cites a number of case studies in which both live and prerecorded videos have been streamed to students and has discussed issues that need to be considered in implementing such systems. In many cases, the video stream

has been used, in Shephard's (2003, p. 301) words, as "a 'relatively isolated' learning resource." In others, it has been used in combination with other resources such as online "slides" and questionnaires. Very often, its use seems to have been within what one might refer to as the multimedia information base paradigm, in which a learner is provided with a variety of information and knowledge resources in support of the learning process, often as resources to explore. This is in contrast to the potential of streaming video in the real-time lecture paradigm, in which a lecturer decides what points to make in what order and in what form (using which media) in order to deliver the lecture and answer questions. Overall, the examples that Shephard and others have cited suggest a general trend towards the greater use of technological possibilities. It would seem to be only a matter of time before at least some educational institutions as well as corporate training establishments start to use truly third-generation systems. There are also indications that such possibilities are increasingly being considered in the business world to support business communication (cf. Panteli & Dawson, 2001).

To exploit the communication potential of multimedia fully, whether in the lecture room, the business meeting, or in other contexts, including distance learning, we need to understand the communication processes that are involved. This is what Nagy, Collyer, Christie, and Southworth (1999) are referring to when they argue for the need to move beyond "literacy" or even "media literacy" to "multimedia literacy."

Much of the discussion of multimedia and multimedia literacy to date has focused on the potential nonlinearity of multimedia compared with traditional media. In particular, much interest has focused on the interactivity that can be associated with nonlinear architecture, especially interactivity that is controlled by the user. Taylor (2002, p. 125), for example, suggests that, "The two key messages of the 'multimedia medium' are its architectural emphasis upon lateral associations ('the hypertext paradigm') and the stimulation afforded by interactivity ('the Nintendo paradigm')." Laurillard (eg, Laurillard, 1996, 2002) and Plowman (eg, Plowman, 2003a, 2003b and 2003c), among others, have presented interesting analyses of the role of interactivity in multimedia in relation to the importance of narrative in affecting learners' comprehension. Laurillard and her colleagues (eg, Laurillard, Stratfold, Luckin, Plowman & Taylor, 2000, Laurillard, 2002) have made important contributions to understanding the role of interactive educational media within what they conceive of as a "conversational framework for learning," and have provided useful guidance concerning a number of key aspects of the design and use of such media.

Yet to acknowledge the importance of these aspects of the new technologies does not vitiate the significance of other factors in helping to understand the potential contribution of multimedia to human communication (cf. the interesting mapping of research questions into a taxonomic space devised by Heller, Martin, Haneef & Gievska-Krliu, 2001 to deal with what they refer to as the "polysemous" nature of multimedia). Bobrowicz and Christie (2003), for example, have examined the potential of multimedia within the historical context of collage and montage. They have been particularly con-

cerned with the communication of meaning through emergent properties of content that arise from the juxtaposition of static and/or dynamic media within a common space. In cognitive terms, the ability of an audience to successfully read this meaning depends in part on the compatibility between the schemas they have available and the schemas used by the multimedia authors (see also Balcytiene & Svirmickiene, 2002). The interrelationships among the media used are an important aspect of this, whether the presentation is linear or nonlinear (as illustrated, for example, by the experimental work of Bétrancourt & Bisseret, 1998, and others, and the work on automatic generation of multimedia presentations by Celentano & Gaggi, 2002).

Cognitive theory also draws attention to the importance of the relationships among the different media used by a multimedia author, particularly with respect to the cognitive processing channels used by the audience. This, again, is aside from questions of interactivity. For example, Mayer (2001) presents a model of multimedia learning based on the proposition that learning is based on the processing of information received through two separate cognitive channels with different characteristics. One of these channels is used to process auditory/verbal information; the other is used to process visual/pictorial information. Learning takes place through the active construction of knowledge from an interaction between information received through these channels and existing knowledge stored in the learner's long-term memory. Interaction between the two input channels is possible and indeed typical of this process. Because each channel has limited capacity, the interactions between the two channels can be important in helping the learner to optimise his or her learning according to the total cognitive load at any given time. Two main sources of cognitive load are recognised by this model: intrinsic load (reflecting the inherent difficulty of the material) and extraneous load (reflecting the way that the material is presented, including the different ways in which media are combined). It is a speaker's skill with respect to the latter that distinguishes him or her from a speaker who is equally knowledgeable in the domain concerned but who is less successful in communicating with his or her audience.

The juxtaposition of different media as well as the interactivity that can be associated with nonlinearity are therefore both important. Understanding and application of multimedia need not be locked exclusively into either the nonlinear information-seeking/exploratory learning paradigm or the paradigm of communication through collage and montage.

The present study focused on the juxtaposition of different media, rather than on questions of interactivity. This is because it was concerned with the use of multimedia by speakers to deliver essentially linear presentations to their audiences. What interactivity there might be in that type of situation arises largely from the possibility of the audience asking questions and the speaker responding to those questions (with or without using multimedia in support of the answers). Assuming that the speaker has planned what he/she is going to say in advance of the presentation, rather than making it up on the spur of the moment, the presentation will be linear except where the speaker branches as a result of a question. (Even in the unlikely event of the speaker only deciding what

route through the subject matter to take at the time of actually delivering the presentation, it will still be a linear experience from the audience's point of view.) The research was concerned with how audiences perceive such presentations when speakers use multimedia to support what they have to say. As Haigh (1994, p. 58) suggests, audiences can react in different ways. The question addressed by the present study was how many? More specifically, can we identify a framework of key dimensions within which we can plot audience reaction?

One approach to addressing this question would be to define a set of dimensions that might simply be intuitively plausible or that might be suggested by relevant theory. As an example of this approach, Bartsch and Cobern (2003) asked students several intuitively interesting questions, including how much they liked particular lectures and how much they felt they learned from them. The lectures were either supported by a software-based presentation aid or by traditional overhead transparencies. Putting somewhat greater emphasis on the theoretical foundations for their measurements, Webster and Ho (1997) measured students' reactions to multimedia-supported lectures in terms of measures suggested by their analysis of the motivational theory of flow (Csikszentmihalyi, 1975). Such studies can provide useful insights and can have some value in testing particular hypotheses. However, data provided by measurements based on intuitively plausible dimensions, whether specifically guided by a particular theoretical model or not, come at a price. The price is that the range of possible answers supported by the data is already determined by the questions that are asked. It presupposes that the key dimensions of audience experience are already known, or can be reliably predicted from theory developed in other contexts. If the audiences' experience actually includes other elements, those will not be detected by the research because the measures required to detect them will not be made. So, while the approach has value, it is sensible to complement it with a different approach—one that allows the audiences themselves to determine what they say about their experience, without having the researcher's presuppositions about the dimensionality of that experience imposed upon them. (For a more general discussion of the balance of these two approaches within the inductive-hypothetico-deductive scientific method, see Cattell, 1978.)

The aim of the present study was to allow audiences themselves to define key dimensions of their experience of live presentations in which speakers made use of multimedia as a presentation aid. The study focused on postgraduate students who in their work later would need to be able to use multimedia effectively in making presentations to clients, suppliers, colleagues, and others. The principal aim was to define a meaningful framework of dimensions that could help such speakers to be more aware of how their audiences experience their presentations. The framework would define a set of dimensions based on what audiences volunteer about their experiences, rather than what they are forced to say in terms of a restricted set of dimensions imposed upon them. As a corollary of this, it was also intended that the framework could help in the academic assessment of such presentations by providing a set of criteria against which to assess presentations in terms of their impact on the audiences' experiences. Third, it was

intended that the results would lay a foundation for future translation into practical resources that could be used within the paradigms to which Mishra (2002) has drawn particular attention in considering the design of learning environments.

Method

There were three main parts to the study:

1. It was considered important to identify words that audiences found natural to apply to presentations of the type concerned, rather than imposing a predetermined set of descriptors on them.
2. The words identified were used as a basis for constructing a set of rating scales that would enable responses to presentations to be quantified. That would enable the interrelationships among the different descriptors to be examined. This part of the study was also concerned with whether the order in which the scales were completed would affect the ratings.
3. The correlations among the rating scales were factor analysed in order to identify a set of factors that might be useful in providing a succinct description of responses to presentations of the type concerned.

The descriptors

Descriptors were determined by asking members of audiences to write words and phrases that applied to presentations they had attended. The method used was as follows.

The speakers

There were 56 speakers in total, in three groups (of 17, 19, and 20). In all cases, they were postgraduate students enrolled on a course leading to a Master of Science in Multimedia Systems. They researched, developed, and delivered their presentations as a key part of their work in one of the units making up the course. They understood that the presentations were "for real" because, as well as being assessed, they formed a key part of the way that topics covered in the unit were considered.

The presentations

Each presentation was on a topic in the field of multimedia facilities management and technical support. The topics were agreed with the course tutors so that a good range of topics suitable for the unit was covered.

The presentations were required to make use of the full range of media (including for example, sounds, photographic images, drawings and charts, animation, video) but with almost no use of text on screen. Each presentation lasted approximately 15 to 25 minutes, including taking questions (up to about 10 minutes). In addition to the large-screen multimedia projection system, a conventional overhead projector and white-board were also available but were rarely used. The speakers also often provided the audience with handouts.

For each group, the presentations were delivered at a meeting held over two days. They were delivered as at a conference, with a short break in the morning and afternoon and a longer break at lunchtime.

The audiences

In each group, the audience consisted of those enrolled on the unit concerned, together with at least two members of the academic staff in their capacity as internal examiners and observers; a technician was also present from time to time. Attendance at the presentations was a requirement of the unit and was an integral part of the learning experience. However, each set of presentations spanned two days and those taking the course part-time were only required to come to the first of the two meetings. There was also some additional coming and going of members of the audience for various reasons during the course of the meetings concerned, again reflecting the style of a conference. The average number in the audience (excluding staff) was between 12 and 14, depending on the group, with a minimum at any one time of 8 and a maximum of 17.

The questionnaire

Each member of the audience was asked to complete a simple questionnaire following each presentation. The aim was to elicit descriptors that the respondents felt natural to apply to the presentations. They were informed that the data were being collected for research purposes and might also be used as part of the academic assessment of the presentations.

There were two parts to the questionnaire. Part 1 asked the respondent to compare the presentation that had just finished with the one immediately before it. This was done by asking the respondent to complete each of three sentences, which were as follows:

1. Compared with the one immediately before it, the last presentation was more...
2. Compared with the one immediately before it, the last presentation was less...
3. Compared with the one immediately before it, the last presentation was equally...

The questionnaire distributed following the first presentation of the morning and the first of the afternoon did not contain Part 1. Part 2 asked the respondent to write at least one and no more than three words that each applied to the presentation that had just finished.

Identifying the descriptors

The responses to each of the three questions in Part 1 were analysed separately from each other and from the responses to Part 2. Spelling mistakes were corrected where possible, but invented words (of which there were very few) were left unchanged. Hyphens were added to form hyphenated words where appropriate in order to avoid counting hyphenated and non-hyphenated versions as separate words. In the case of Part 1, responses that were clearly combinations of separable components were split into their components. For example, "creative and exciting" was treated as two descriptors, "creative" and "exciting."

The responses were analysed with a view to identifying a manageable number of descriptors that had some general currency. A key criterion was that any descriptor included in the final set should have been used at least once by someone in all three audiences.

From Part 2 of the questionnaire, a total of 38 words were identified as having been used at least once by all three audiences. Of those, "designed" and "researched" were dropped, being considered to be too close to "well-designed" and "well-researched," which were retained, making a total of 36 descriptors from Part 2.

Most of the responses to Part 1 were complex phrases that appeared only once. However, seven additional words were identified that were not included in the 36 from Part 2 and which had been used at least once by all three audiences. They brought the total number to 43. Finally, "presented" was dropped, being too close to "well-presented," which was retained, bringing the number of descriptors in the final set to 42.

The rating forms

Two forms were constructed. Each was made by listing the 42 words, with each word followed by a row of ten boxes. The instruction at the top of the form was as follows:

> Please tick one of the boxes 0 to 10 for each word, according to how well the word applies to the presentation. Tick the "0" box if the word does not apply at all. Tick the "10" box if it applies perfectly.

The two versions of the form differed only in the order of the items, which was determined at random. Having two versions of the form provided a means of checking whether the order of the items had a significant effect on the responses. (In principle, determining the positions of the words in the list at random could by chance result in two identical versions of the form, which would then obviously not be suitable for the purpose of comparing two different versions. Table 1 shows that the two versions were actually very different, the difference in the position of words from one version to the other ranging from 0—the word was in the same position in both forms—to 41, with an average change in position of 14 places in the list.)

The factor analysis

The data for the factor analysis was obtained by asking members of an audience to complete the 42 rating scales for each of a number of presentations. The method used was as follows:

The speakers

The 20 speakers were postgraduate students enrolled on a course leading to a Master of Science in Multimedia Systems. They researched, developed, and delivered their presentations as a key part of their work in one of the units making up the course. As with the speakers who participated in the earlier part of the study, they understood that the

presentations were "for real" because, as well as being assessed, they formed a key part of the way that topics covered in the unit were considered.

The presentations

As with the earlier presentations, each presentation was on a topic in the field of multimedia facilities management and technical support, as agreed with the course tutors. The nature of the presentations was as before (see above). As before, they were delivered at a meeting held over two days, with a short break each morning and afternoon and a longer break at lunchtime.

The audience

The audience again consisted of those enrolled on the unit concerned, together with at least two members of the academic staff in their capacity as internal examiners and observers; a technician was also present from time to time. As before, those taking the course part-time were only required to come to the first of the two meetings. There was also some additional coming and going for various reasons, again reflecting the style of a conference. The number of people in the audience (excluding staff) ranged from a maximum of 17 (when the part-timers were present) to a minimum of 5 (when they were not). That gave an average of 11 at any one time, making a total of 219 cases in which a presentation was rated by a member of the audience. (The number of judges for each presentation is given in Table 5.) Approximately half the audience completed one version of the rating form following each presentation and the remainder completed the other.

Results

The interform reliability of the scales

The average score for each of the 20 presentations on each of the 42 scales was calculated for each version of the rating form. For any given scale, the interform reliability is the product–moment correlation (over the 20 presentations) between the average ratings from one form and the ratings from the other. It provides an indication of the extent to which the relative positioning of the presentations on that scale are affected by having two forms. The interform reliability of each scale, given in Table 1, was more than 0.70 for 29 of the scales and was more than 0.60 in all but three cases.

Reliability as a function of position on the form

As expected, there was some variation in interform reliability from one scale to another. Was this a function of the scale's position in the form? If the position of a scale affected the ratings on it, one would expect the reliability of the scale to be less when the change in its position from one form to the other is greater. The distance between the position of any given scale in one version of the form and its position in the other is given in the rightmost column in Table 1. The product–moment correlation between the interform reliabilities (in the left column) and the difference in position across the two forms (in the right column) is only –0.15, which is negligible. This suggests that the order in which the scales appeared on the form did not affect their reliability.

Table 1: Comparison of the two forms

Descriptor	*Interform reliability*	*Difference in position in the list*
Animated	0.66	14
Clear	0.80	8
Colourful	0.76	4
Comprehensive	0.73	30
Concise	0.71	21
Creative	0.68	20
Detailed	0.89	34
Dynamic	0.66	27
Engaging	0.68	1
Entertaining	0.70	34
Excellent	0.82	4
Flowing	0.74	8
Fluid	0.83	14
Focused	0.73	7
Formal	0.59	8
Fun	0.77	17
Good	0.74	5
Imaginative	0.74	41
In-depth	0.78	10
Informative	0.84	11
Informed	0.87	4
Innovative	0.52	25
Interactive	0.62	10
Interesting	0.75	6
Lively	0.69	6
Multimedia	0.70	5
Musical	0.76	15
Nice	0.78	4
Planned	0.79	4
Professional	0.74	1
Relaxed	0.82	19
Slick	0.69	34
Smooth	0.65	0
Static	0.58	32
Structured	0.73	11
Stylish	0.83	27
Succinct	0.89	2
Thorough	0.86	34
Visual	0.73	5
Well-designed	0.81	8
Well-presented	0.72	21
Well-researched	0.88	1
Maximum difference		41
Average difference		14
Minimum difference		0

Note. The scales are listed in alphabetical order.

The factor analysis

Given that the order of the scales did not seem to affect their reliability, the data for the two different versions of the rating form were pooled. This resulted in a total of 219 cases in which a presentation was rated by a member of the audience. The product–moment correlations among the 42 scales were calculated across those 219 cases, reflecting variation from person to person in the audience as well as from presentation to presentation. In classical Cattellian factor analysis, this type of design is referred to as a grid (eg, Cattell, 1978, p. 335).

A Principal Components analysis was used to determine the number of components to consider. Three components had eigenvalues greater than 1.00, and inspection of the scree plot confirmed that number of components to be of interest.

The three components were rotated to oblique simple structure using the Promax method (kappa = 4). To further test the appropriateness of the solution, a four-factor solution was also derived. This was clearly less semantically elegant than the three-factor solution, thereby providing further support to the conclusion based on the eigenvalues criterion and the scree test.

The factor structure matrix for the three-factor solution is presented in Table 2. This shows the correlations between the rating scales and the factors.

The factor pattern matrix is presented in Table 3. This shows the factor loadings. These provide a clearer picture of the association between the original descriptors and the factors, in the sense that they show the degree of association once the effect of the correlations among the factors themselves is removed. The factor loadings are the weights given to the factor scores when estimating any given subject's response on any given rating scale.

The correlations among the factors are presented in Table 4.

The academic grades awarded for the presentations are shown in Table 5, along with the average factor scores and their sums, sorted in order of the sums.

Discussion

The factors identified

The study suggests that three factors may be most important in describing audiences' responses to live presentations made by speakers who use multimedia as a presentation aid. These factors describe the way that perceptions vary from one member of an audience to another and from one presentation to another. They seem to be concerned with:

- the knowledge content of what is presented;
- the creativity and imaginativeness with which it is presented; and
- the fun factor.

Table 2: The factor structure matrix (the simple correlations between the rating scales and the factors; values cannot exceed plus or minus 1.00)

	Factor		
	1	*2*	*3*
Descriptor	*Knowledge content*	*Creativity*	*Fun*
Animated	0.658	0.852	0.627
Clear	0.915	0.649	0.723
Colourful	0.671	0.794	0.636
Comprehensive	0.838	0.646	0.643
Concise	0.803	0.661	0.805
Creative	0.638	0.914	0.642
Detailed	0.889	0.605	0.552
Dynamic	0.720	0.843	0.804
Engaging	0.759	0.848	0.845
Entertaining	0.767	0.796	0.871
Excellent	0.855	0.774	0.735
Flowing	0.871	0.733	0.776
Fluid	0.871	0.770	0.799
Focused	0.883	0.620	0.692
Formal	0.707	0.546	0.576
Fun	0.716	0.787	0.831
Good	0.906	0.713	0.756
Imaginative	0.566	0.833	0.674
In-depth	0.884	0.519	0.494
Informative	0.916	0.598	0.597
Informed	0.916	0.599	0.582
Innovative	0.646	0.859	0.674
Interactive	0.563	0.844	0.584
Interesting	0.824	0.827	0.799
Lively	0.690	0.820	0.820
Multimedia	0.609	0.870	0.627
Musical	0.321	0.403	0.691
Nice	0.870	0.692	0.688
Planned	0.875	0.728	0.716
Professional	0.896	0.703	0.753
Relaxed	0.754	0.416	0.678
Slick	0.738	0.794	0.781
Smooth	0.835	0.693	0.784
Static	–0.046	0.368	–0.088
Structured	0.865	0.763	0.704
Stylish	0.774	0.849	0.689
Succinct	0.812	0.565	0.755
Thorough	0.875	0.597	0.468
Visual	0.701	0.832	0.588
Well-designed	0.796	0.843	0.661
Well-presented	0.870	0.627	0.753
Well-researched	0.915	0.604	0.554

Note. The scales are listed in alphabetical order.

Table 3: The factor pattern matrix (the correlations between the rating scales and the factors, taking account of the correlations among the factors themselves; values can exceed plus or minus 1.00)

	Factor		
	1	*2*	*3*
Descriptor	*Knowledge content*	*Creativity*	*Fun*
Animated	0.116	0.804	–0.047
Clear	0.863	–0.075	0.143
Colourful	0.199	0.631	0.027
Comprehensive	0.764	0.084	0.019
Concise	0.471	–0.027	0.478
Creative	–0.013	0.964	–0.055
Detailed	1.042	0.033	–0.239
Dynamic	0.079	0.517	0.368
Engaging	0.124	0.447	0.427
Entertaining	0.167	0.277	0.545
Excellent	0.574	0.287	0.103
Flowing	0.606	0.122	0.241
Fluid	0.545	0.191	0.258
Focused	0.847	–0.082	0.129
Formal	0.604	0.034	0.107
Fun	0.092	0.349	0.507
Good	0.739	0.059	0.169
Imaginative	–0.157	0.793	0.208
In-depth	1.182	–0.116	–0.291
Informative	1.064	–0.064	–0.139
Informed	1.080	–0.043	–0.181
Innovative	0.024	0.779	0.086
Interactive	–0.070	0.926	–0.043
Interesting	0.368	0.379	0.251
Lively	0.005	0.472	0.472
Multimedia	–0.026	0.897	–0.010
Musical	–0.380	–0.076	1.026
Nice	0.747	0.119	0.051
Planned	0.692	0.173	0.080
Professional	0.726	0.048	0.184
Relaxed	0.733	–0.456	0.473
Slick	0.199	0.403	0.340
Smooth	0.545	0.045	0.350
Static	0.346	–0.788	0.234
Structured	0.645	0.288	0.019
Stylish	0.345	0.611	–0.012
Succinct	0.646	–0.223	0.444
Thorough	1.110	0.122	–0.439
Visual	0.292	0.753	–0.178
Well-designed	0.439	0.604	–0.104
Well-presented	0.735	–0.120	0.300
Well-researched	1.105	0.022	–0.260

Note. The scales are listed in alphabetical order.

Table 4: The correlations among the factors

Factor	1	2	3
1	1.000	0.717	0.736
2		1.000	0.732
3			1.000

Table 5: The academic grades awarded and average factor scores

		Factor				
		1	2	3		
Presentation	No. of judges	Knowledge content	Creativity	Fun	Sum	Grade
15	8	0.72	1.1	1.08	2.90	
16	8	0.59	1.11	0.7	2.40	D
11	8	0.89	0.72	0.78	2.39	
18	8	0.66	0.53	0.56	1.75	
9	14	0.63	0.48	0.52	1.63	
3	16	0.11	0.4	0.78	1.29	D
1	14	0.43	0.21	0.18	0.82	
12	8	0.32	0.26	0.11	0.69	
2	17	0.15	0.27	0.16	0.58	
8	14	0.33	0.14	–0.21	0.26	D
20	7	0.17	0.13	–0.08	0.22	
5	15	0.01	–0.11	0.08	–0.02	
13	5	0.19	–0.17	–0.1	–0.08	
14	6	0.13	0.24	–0.45	–0.08	
19	7	–0.52	0.06	0.3	–0.16	
4	13	–0.25	–0.72	0.25	–0.72	
7	16	–0.11	–0.6	–0.37	–1.08	
6	14	–0.34	–0.14	–1.11	–1.59	
10	13	–1.38	–1.81	–1.26	–4.45	F
17	8	–2.63	–1.01	–1.61	–5.25	F

Note. The academic grade is Pass except where shown as D for Distinction or F for Fail.

As well as being intuitively appealing, the emergence of these factors in the current data provides some empirical support for the application of the "Elaboration Likelihood Model" to users' engagement with multimedia (see Balcytiene & Svirmickiene, 2002). This theoretical model suggests that two routes to engagement with multimedia can be distinguished: the central route and the peripheral route. Balcytiene and Svirmickiene suggest that those who have a high involvement with the topic concerned are more likely to take the central route. This "involves careful thinking about the content of the message, reflecting upon the ideas and information contained in it," and "corresponds to a high level of media literacy" (p. 139). The present study suggests that this postu-

lated "central route" to engagement may be reflected in an observable dimension of audience reaction, identified in this study as Factor 1 (knowledge content). According to the theory, those who are less involved with the topic are less likely to take the central route but may still be engaged with the material through the peripheral route. This depends upon a variety of "peripheral cues," which include multimedia features. In the present study, this postulated "peripheral route" seems to be reflected in the second and third dimensions of audience reaction, Factors 2 (creativity) and 3 (fun). The latter in particular provides some empirical evidence for the view that fun may be an important consideration in distinguishing between different learning situations (for example, see Balcytiene & Svirmickiene, 2002, pp. 139–140). The factors are considered in more detail in the next paragraphs.

Factor 1: the knowledge content

The first factor seems to be concerned with the knowledge content of the presentation. It describes how well researched and informative members of the audience consider the presentation to be. The five highest loading descriptors in the factor pattern matrix (Table 3) are (in order): "in-depth," "thorough," "well-researched," "informed," and "informative." Given their high loadings, these descriptors provide a good picture of Factor 1, especially as their loadings on the other two factors are much smaller. A similar picture emerges from the factor structure matrix (Table 2), where the two descriptors most highly correlated with Factor 1 are: "informative" and "informed." As suggested above, this is the factor that would most clearly underpin the central route to audience engagement postulated by the Elaboration Likelihood Model. It also relates to the cognitive concept of "intrinsic cognitive load" as discussed in the introduction to this paper in connection with Mayer's theory of multimedia learning. In general, one would expect high scores on Factor 1 to be associated with higher levels of intrinsic cognitive load, and low scores to be associated with lower levels. A successful presentation in terms of these factors would be one that achieved an optimal balance. It would be perceived by the audience as in-depth, thorough, well-researched and informed without being "over their heads" (too high in terms of intrinsic cognitive load). Perhaps this explains the high loading of "informative" on Factor 1 in this study. In the researchers' judgement, none of the presentations was too demanding of the audience in terms of its intrinsic cognitive load. Perhaps in another study, in which much more demanding subject-matter were to be presented by some speakers, one might find that Factor 1 split such that presentations judged to be highly informed might not necessarily be judged to be highly informative. (Some presentations, although highly informed, might simply "go over the heads" of the audience).

Factor 2: creativity and imaginativeness

The second factor concerns the design of the presentation, including how creative and imaginative it is seen to be. The five highest loading descriptors in Table 3 are (in order): "creative," "interactive," "multimedia," "animated," and "imaginative." Given their high loadings, these descriptors provide a good picture of Factor 2, especially as their loadings on the other two factors are much smaller. A similar picture emerges from the factor structure matrix (Table 2), where the two descriptors most highly correlated with

Factor 2 are: "creative" and "multimedia." This factor is the one that would most clearly underpin the peripheral route to audience engagement postulated by the Elaboration Likelihood Model. In terms of Mayer's theory of multimedia learning, it relates conceptually to the cognitive concept of extraneous load. The relationship is not, however, straightforward because the creative and imaginative use of different media can be expected to reduce extraneous cognitive load if the design is appropriate but could raise load if it is inappropriate.

Factor 3: the fun factor

The third factor is not quite so clearly defined. It seems to reflect how entertaining the audience found the presentation, taken as a whole. The three highest loading descriptors in Table 3 are (in order): "musical," "entertaining," and "fun." The other descriptors load the other two factors as much or more than they load Factor 3, so it is the three highest loading that give the clearest picture of what this factor is about. Inspection of the factor structure matrix (Table 2) supports this interpretation of the factor. The descriptors "entertaining" and "fun" are two of the three descriptors that are most highly correlated with the factor. The descriptor "engaging" is also highly correlated with it but that descriptor is also highly correlated with the other two factors. The descriptor "musical," which helps to define Factor 3 in the factor pattern matrix, is seen in the factor structure matrix to be only moderately correlated with the factor but to have even lower correlations with the other two factors. In terms of the Elaboration Likelihood Model, this factor might, along with Factor 2, also reflect the extent to which a presentation provides a strong peripheral route to audience engagement, as well as audience predilection for taking that route. It also links conceptually to the cognitive concept of extraneous load in a similar way to Factor 2.

The correlations among the factors

The Promax method of factor rotation allows for an orthogonal solution where that is appropriate. This can easily be demonstrated using artificial data. In this case, however, the factors are clearly correlated, the correlations in Table 4 ranging from 0.72 to 0.74. Why is that? The following considerations may be relevant.

Presenters may differ in how skilful they are in researching their subject, interpreting what they have to say into multimedia and in other aspects of developing and delivering presentations. Also, some presenters may be more motivated than others and, as in other areas of their work, may tend to achieve more with whatever level of skill they have. People also differ in terms of their personality, charisma, confidence, and related characteristics. All these could influence the effectiveness of their presentations and contribute to the positive correlations observed.

In addition to the possibility of a general "presenter effect," there may be intrinsic connections among different aspects of audience reaction. For example, except in the case of a comedy routine, it might be unlikely that an audience would find it much fun to sit through an uninformed and uninformative presentation.

It may also be that particular multimedia elements sometimes impact more than one aspect of the audience experience. For example, when a presenter adds a particular element to a presentation—a video clip, for example—that might make the presentation more informative in some way, but it might also add to the impression of how creative and imaginative he/she has been.

Further research is needed to assess the relative importance of these different possible contributors to the correlations observed among the three factors.

Implications for speakers intending to use multimedia in their presentations

The three factors provide a framework within which speakers can set design goals when preparing a presentation. The speaker must decide on what balance among the factors would be appropriate for the purpose of the presentation and the audience concerned. In particular, the speaker must decide how much emphasis should be put on:

1. giving an impression that the presentation has been well-researched and is informative;
2. impressing the audience with the design of the presentation, especially the use made of multimedia; and
3. entertaining the audience, making their experience fun.

Further research is needed to determine what can be done to achieve each of these three. However, we can see that attention probably needs to be given to all stages of the development and delivery of the presentation if optimal results are to be achieved. As Haigh (1994, p. 58) suggests, "the art of giving a good presentation starts from the very first moment you realise you are going to have to speak in front of other people." We may add that it does not end until one hands the floor to someone else, or possibly even after one has left the building. Within that general framework, it is clear that, in principle, it may be possible to do different things at different stages, in particular:

1. when researching the context for the presentation, including such matters as its aims, the nature of the audience, the nature of the occasion and the location;
2. when researching the substantive content;
3. when constructing the multimedia; and
4. when delivering the presentation, including the handling of questions and other interventions from the audience or other parties.

Implications for training speakers in the use of multimedia

The "educational" and the "corporate" learning environments distinguished by Rushby (2003) have in common a trend towards increasing penetration of information technology, including multimedia and, with that, rising expectations concerning methods and quality of communication. Helping learners in both environments to acquire the necessary understanding and skills to use multimedia effectively when speaking to an audience is likely to be of increasing importance, and, indeed, should be one of those common areas addressed by the UK government's e-learning strategy to which Rushby refers. In both environments, one key ingredient in the training should be helping

learners to be more sensitive to their audiences, especially helping them to see their presentations as their audiences see them. Key to that is understanding the criteria that audiences implicitly use in judging presentations. The present study throws some light on that by identifying what seem to have been the three key criteria spontaneously used by the audiences concerned.

How the educator or trainer applies these findings in practice depends in part on the view one takes of the teaching and learning process. Here, the three key paradigms identified by Mishra (2002) in connection with the design of learning environments (the constructivist, cognitivist, and behaviourist paradigms) provide some useful guidance.

From a constructivist viewpoint, the educator/trainer is principally a facilitator, helping the learner/trainee to construct his or her understanding of the domain concerned (cf. Guo, 2003). Indeed, Guo (2003, p. 252), in considering the role of the teacher in the context of a technology-supported learning environment, has gone so far as to suggest that the "teacher is firstly a manager of learning." Part of this is to provide suitable resources that the learner can draw upon. Some of those resources can be physical resources, such as computers, and others can be knowledge resources, such as theoretical models. The present study suggests one type of knowledge resource that could be provided. That is the three-factor model of audience experience outlined above. Learners could be offered the model as an aid in constructing their understanding of the audience experience. The study also provides a second resource: an instrument (a specific set of rating scales) for indexing audience response in terms of the model. That resource offers the learner a means of seeing his or her particular presentation from a particular audience's perspective. That, in turn, provides the learner with another knowledge-building block to use in constructing an understanding of the relationship between how he/she uses multimedia and how audiences respond.

In terms of the cognitive paradigm (also referred to as the "cognitivist" paradigm), the instrument (set of rating scales) provides the teacher with a means of providing the learner with feedback based on measures of audience reaction. From a cognitive perspective, this is fundamental to enabling the learner to modify the plans and other cognitive structures that underpin his or her behaviour. This would be done within the context of an iterative learning process. During each iteration, the learner would plan his or her approach to the task, test that plan by applying it to a specific presentation given to a specific audience, and evaluate the results in terms of the feedback concerning audience reaction. Cognitive theory suggests that learning would take place over a number of iterations as the learner's plans and other cognitive structures become refined in the light of feedback received.

Within the behaviourist paradigm, what the learner does when preparing and delivering a multimedia presentation can be analysed into a large number of specific components or "operants." In the present context, those range from operants needed to produce the presentation (such as the specific elements of behaviour involved in using

multimedia authoring software) to the movements, gestures, posture, and other aspects of a speaker's behaviour when delivering the presentation (as described, for example, by Freeburn 1995). Some of the operants are more desirable than others, and the role of the teacher is to "shape" the learner's behaviour such that the ratio of desirable operants to undesirable ones progressively increases. This is done by "reinforcing" the desirable ones by rewarding the learner for producing those and not rewarding him or her (or possibly even punishing him or her) when he/she produces undesirable ones. Critical to the behaviourist paradigm is the definition of what constitutes a "reinforcer" or reward. It depends on the particular situation but is effectively defined in a circular way as being whatever it is that reinforces the desired operants. In the present context, it is reasonable to assume that providing the learner with a completed evaluation form showing that the audience rated his or her presentation in the way the learner hoped for would be rewarding. In contrast, providing a form that indicated the reverse would not be rewarding and might even be experienced as punishing. The findings from the present study provide a basis for writing an evaluation form that could be used in this way to reward learners for some presentations (and, as an integral part of that, the operants that resulted in those) and not for others.

Implications for academic assessment of communication skills

Table 5 shows the relationship between the academic grades awarded and the average factor scores for the presentations. The academic grades were agreed by the examiners according to the procedures normally used, without knowledge of the audiences' ratings or the results of the factor analysis. Only three grades were possible under the regulations governing the unit: Distinction, Pass, or Fail.

Reflecting the key learning outcomes of the unit, the grades were awarded according to the following criteria:

- The extent to which the candidate demonstrated an understanding of the subject he/she was presenting. This was always an aspect of technical support or facilities management in the field of multimedia systems, as agreed with the tutors in advance.
- The extent to which he/she took a professional approach to the development of the multimedia material, taking account of all aspects of the process from initial research of the subject being presented to final implementation in multimedia (including all aspects of that—for example, intellectual property rights—not just design and software aspects).
- The effectiveness of the multimedia material he/she had prepared.
- The extent to which he/she presented the subject matter effectively on the day, making good use of the multimedia material he/she had prepared.

Evidence used by the examiners in the assessment process included the following:

- Progress meetings with the candidate throughout the development process.
- A workbook explaining the method used for developing the presentation. That included evidence of the candidate's investigation of the subject matter (through library research, interviews, and/or other methods) and his or her method of

translating the results of that investigation into a multimedia-supported live presentation (including draft storyboards, scripts, and other relevant items).
- A CD-ROM containing the multimedia material used by the candidate.
- The candidate's performance on the day as witnessed by at least two examiners, together with copies of the handouts and other materials used on the day as well as the examiners' impressions of audience reaction.

It can be seen that the academic grades were intended to reflect several different aspects of the candidates' achievements, not just audience reaction to the presentation as delivered on the day. However, audience reaction was one consideration, and so it is of some interest to look at the grades awarded in relation to the factor scores achieved by the presentations. (Of course, audience reaction itself would be expected to some extent—although not completely—to reflect the amount and quality of work that the candidate put into researching the subject, developing the multimedia, and presenting it on the day.)

It can be seen from Table 5 that the cases that were deemed by the examiners to have failed were also those that were received least favourably by their audiences in terms of the three-factor model presented in this paper. They received the lowest scores, summed over the three factors, and the lowest scores on each of the three factors separately. The picture is less clear when it comes to the award of a distinction. All the presentations awarded a distinction received a favourable audience reaction, all of them lying in the upper half of Table 5. However, it is also clear that there is no simple relationship between audience reaction and cases deemed by the examiners to warrant award of a distinction. This is consistent with the general principle to which they were working that more is required for a distinction than simply achieving a favourable audience reaction.

An analysis of audience reaction in terms of the three-factor model presented in this paper may help examiners in their academic assessments in future years. This is likely to be mostly by providing a further check in the process. Given the strong relationship between audience reaction and cases that failed, examiners in future years might find it helpful to use this model of audience reaction to provide them with further input to their deliberations in cases which they consider to be borderline Pass/Fail. To a lesser extent, they may find it helpful to check that potential distinctions fall in approximately the upper half of audience reaction, and, if there are any anomalies, they may wish to give those cases further consideration and/or consider how they can be explained.

Implications for research

Those leaving university in the future will be expected to be skilled in using multimedia to communicate effectively, just as those leaving in past years have been expected to be able to use conventional media. That skill must depend to some extent upon an understanding of the audience experience.

The present study contributes to understanding of the audience experience by suggesting a three-factor model of it. Four main research priorities can be identified to take the work further:

1. The findings from this particular study are self-evidently most applicable to the kind of speaker, audience, and subject matter that were the focus of the study—that is, postgraduate students delivering presentations on technical matters to other postgraduate students. Further research is needed to establish to what extent the findings are applicable more broadly. That means carrying out similar studies across a broader range of speakers, audiences, and subject matter. The present study provides a useful starting point in terms of the method to be used. It also suggests a three-factor model that can be used as a reference point for considering the results of future studies.
2. A person speaking to an audience in the same room is not the only way in which speakers nowadays can communicate live with an audience. The growth in popularity of the Internet, mobile phone networks, and other communications media mean that the possibilities for speakers to interact with audiences at a distance are increasing. This applies in education as much as in other contexts. It is not logically required that the dynamics of interaction between a speaker and his or her audience will be the same when they are in the same room as when they are at a distance. Indeed, evidence that there may be interesting differences goes back well over a quarter of a century (see, for example, Short, Williams & Christie, 1976). Further empirical work is required to see whether, in the case of speakers using multimedia as a presentation aid, the audience experience of online presentations in educational and other contexts parallels that of audiences in the same physical room as the speaker or whether it is different in significant ways. This could have practical implications for the design of distance learning courses.
3. Knowing how audiences are reacting is one thing, knowing what to do about it is another. The findings from the present study provide a set of reference criteria against which to assess the success or otherwise of a presentation in terms of the audience experience. A priority now must be to research what speakers can do when developing and delivering their presentations to produce presentations that are successful in terms of those criteria. That research should include controlled experiments in which the dimensions of audience reaction described in this paper are used as dependent variables whilst aspects of presentations are systematically varied. It should also include multivariate research that again uses the same measures as dependent variables in an attempt to tease out the relative importance of different elements in actual business or academic presentations delivered in the course of normal business.
4. The three-factor model and associated set of rating scales presented in this paper provide a means of giving learners feedback concerning audience reaction to their presentations. Future research should examine how the model and ratings scales are best used in that way. That includes looking at such matters as the form in which to provide the feedback and in what precise context to provide it in order for it to have maximum beneficial (and minimal detrimental) effect on the training process.

Conclusions

The study suggests that, in the type of situation studied, there may be three main dimensions of audience reaction to presentations given by speakers who use multimedia as a presentation aid. They seem to be concerned with:

- the knowledge content of what is presented;
- the creativity and imaginativeness with which it is presented; and
- how entertaining and fun the audience finds the overall experience.

The three-factor model and associated set of rating scales developed provide a basis for giving learners feedback concerning the extent to which they are achieving the kind of audience experience they are aiming for. They also provide a practical basis for incorporating audience reaction into the framework for assessing student presentations.

References

Aziz, K. (1998). The key to perfect presentations. *Industrial and Commercial Training 30*, 214–217.

Baines, A. (1994). We present... *Work Study 43*, 26.

Bartsch, R. A. & Cobern, K. M. (2003). Effectiveness of PowerPoint presentations in lectures. *Computers & Education 41*, 77–86.

Balcytiene, A. & Svirmickiene, D. (2002). Cognitive processing of multimedia documents. A Lithuanian study. In P. A. Bruck (Ed.), *Understanding the European Content Industries: A Reader on the Economic and Cultural Contexts of Multimedia* IOS Press, Amsterdam, 135–153.

Bétrancourt, M. & Bisseret, A. (1998). Integrating textual and pictorial information via pop-up windows: an experimental study. *Behaviour & Information Technology 17*, 263–273.

Bobrowicz, A. & Christie, B. (2003). Usability and emergent properties of multimedia creations. Paper presented at the Europrix Scholars Conference 2003: Information Society and Digital Media For All, in Tampere, Finland, November 13–14.

Bull, M., Christie, B. & Collyer, J. (1995). Multimedia in business. *Electrotechnology October/November*, 18–20.

Cattell, R. B. (1978). *The scientific use of factor analysis in behavioral and life sciences*. New York: Plenum Press.

Celentano, A. & Gaggi, O. (2002). Schema modelling for automatic generation of multimedia presentations. Paper presented at SEKE '02, July 15–19, 2002, Ischia, Italy. ACM 1-58113-556-4/02/0700.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. San Francisco, CA: Jossey-Bass.

Freeburn, R. (1995). Speaking in public, part III: let your body speak for you. *Executive Development 8*, 12–14.

Guo, S. (2003). Art and dream. *British Journal of Educational Technology 34*, 243–254.

Haigh, J. (1994). Fear, truth and reality in making presentations. *Management Decision 32*, 58–60.

Hawkridge, D. (1999). Thirty years on, BJET! And educational technology comes of age. *British Journal of Educational Technology 30*, 293–304.

Heller, R. S., Martin, C. D., Haneef, N. & Gievska-Krliu, S. (2001). Using a theoretical multimedia taxonomy framework. *ACM Journal of Educational Resources in Computing 1*, Spring 2001, Article #4, 22 pages.

Khine, M. S. & Lourdusamy, A. (2003). Blended learning approach in teacher education: combining face-to-face instruction, multimedia viewing and online discussion. *British Journal of Educational Technology 34*, 671–675.

Laurillard, D. M. (1966). Multimedia and the learner's experience of narrative. Keynote speech for Ed-Media, Boston 1996. Retrieved November 25, 2003, from http://meno.open.ac.uk/meno-pubs.html.

Laurillard, D. (2002). *Rethinking university teaching: a framework for the effective use of educational technology, second edition*. London: RoutledgeFalmer.

Laurillard, D., Stratfold, S., Luckin, R., Plowman, L. & Taylor, J. (2000). Affordances for learning in a non-linear narrative medium. *Journal of Interactive Media in Education 2000*. Retrieved 25 November 2003, from http://www-jime.open.ac.uk/00/2/laurillard-00-2-paper.html.

Marks, L. S., Penson, D. F., Maller, J. J., Nielsen, R. T. & deKernion, J. B. (1997). Computer-generated graphical presentations: use of multimedia to enhance communication. *Urology 49*, 2–9.

Mayer, R. E. (2001). *Multimedia learning*. Cambridge: Cambridge University Press.

Mishra, S. (2002). A design framework for online learning environments. *British Journal of Educational Technology 33*, 493–496.

Nagy, A., Collyer, J., Christie, B. & Southworth, K. (1999). *Usability: a multimedia concept*. Paper presented at the Europrix 99 Conference: Understanding the European Content Industries—Towards a European Multimedia Economy, Tampere, Finland, November 19–20, 1999.

Nolan, S. (2002). Interactive TV. Planned educational uses versus real educational needs. In P. A. Bruck (Ed.), *Understanding the European content industries: a reader on the economic and cultural contexts of multimedia* (pp. 154–168). Amsterdam: IOS Press.

Panteli, N. & Dawson, P. (2001). Video conferencing meetings: changing patterns of business communication. *New Technology, Work and Employment 16*, 88–99.

Plowman, L. (2003a). *Narrative, interactivity and the secret world of multimedia*. A publication from the MENO project. Retrieved February 12, 2003, from http://meno.open.ac.uk/meno-eandm.html.

Plowman, L. (2003b). *Getting side-tracked: cognitive overload, narrative, and interactive learning environments*. A publication from the MENO project. Retrieved February 12, 2003, from http://meno.open.ac.uk/meno-eandm.html.

Plowman, L. (2003c). *Designing interactive media for schools: a review based on contextual observation*. A publication from the MENO project. Retrieved February 12, 2003, from http://meno.open.ac.uk/meno-eandm.html.

Rekkedal, T. (2003). *Teaching and learning in the electronic college: some didactic considerations based on feedback from students*. Retrieved February 12, 2003, from http://learning.ericsson.net/mediaweb/articlelinks/article10.html.

Rushby, N. (2003). Editorial. *British Journal of Educational Technology 34*, 545–547.

Shephard, K. (2003). Questioning, promoting and evaluating the use of streaming video to support student learning. *British Journal of Educational Technology 34*, 295–308.

Short, J., Williams, E. & Christie, B. (1976). *The social psychology of telecommunications*. Chichester: John Wiley & Sons.

Taylor, P. A. (2002). Digital dread and hyperbole. The cultural context of multimedia. In P. A. Bruck (Ed.), *Understanding the European content industries: a reader on the economic and cultural contexts of multimedia* (pp. 111–128). IOS Press, Amsterdam.

Webster, J. & Ho, H. (1997). Audience engagement in multimedia presentations. *The Database for Advances in Information Systems 28*, 63–77.