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Participation at exhibits: Creating engagement with new technologies in science centres

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8 Exhibiting Performance: Co-participation in science centres and museums
9

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20 There is a growing commitment within science centres and museums to deploy computer-
21 based exhibits to enhance participation and engage visitors with socio-scientific issues. As
22 yet however, we have little understanding of the interaction and communication that arises
23 with and around these forms of exhibits, and the extent to which they do indeed facilitate
24 engagement. In this paper, we examine the use of novel computer-based exhibits to explore
25 how people, both alone and with others, interact with and around the installations. The data
26 are drawn from video-based field studies of the conduct and communication of visitors to the
27 Energy Gallery at London's Science Museum. The paper explores how visitors transform
28 their activity with and around computer-based exhibits into performances, and how such
29 performances create shared experiences. It reveals how these performances can attract other
30 people to become an audience to an individual's use of the system and subsequently sustain
31 their engagement with both the performance and the exhibit. The observations and findings
32 of the study are used to reflect upon the extent to which the design of exhibits enables
33 particular forms of co-participation or shared experiences, and to develop design sensitivities
34 that exhibition managers and designers may consider when wishing to engender novel ways
35 of engagement and participation with and around computer-based exhibits.
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For informal science institutions, like science centres and museums, inspiring individuals to engage with science has long been a primary goal (cf. Csikszentmihalyi & Hermanson, 1995; Hennes, 2002; Perry, 1989, 1993; Semper, 1990). As a result such institutions grapple with ways to support visitor engagement with science, and are thus concerned with visitor attitudes towards both science and representations of science. The authors of this paper, being a mix of academic researchers and practitioners at a science museum, respect that museum educators and exhibit developers take seriously the challenge of making subjects commonly perceived as boring or difficult engaging and have worked to develop ways to draw visitors into exhibits that aim to teach complex concepts from which most visitors would normally shy away. As such, a common task for those within the museum community, and perhaps more broadly within science education, is – how do you make the seemingly tedious engaging?

Computer-based exhibits, particularly simulations and games, are often seen by museum educators and designers as a way forward – a means of engaging visitors with complex concepts in innovative ways (Farmelo & Carding, 1997). Interestingly, however, the innovation rarely goes beyond designing exhibits that rely primarily on conventional human-computer interfaces such as keyboards, pushbuttons and touch screens (Heath, vom Lehn, & Osborne, 2005). Although research suggests that technologically-rich exhibits attract and hold visitor attention (cf. Sandifer, 2003), we have little understanding of how visitors examine and make sense of computer-based exhibits. The little understanding we do have

1
2
3 relies on making sense of one form of social interaction, namely visitors' conversations
4
5 (Leinhardt, Crowley, & Knutson, 2002; Leinhardt & Knutson, 2004).
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8 This paper seeks to contribute to the knowledgebase by looking at participation, and
9
10 in particular how shared experiences arise both in and through visitors' performative activity
11
12 with and around computer-based exhibits in the Energy Gallery at London's Science
13
14 Museum – exhibits that have been designed with, among other aims, the intention of
15
16 engendering a range of activities that might be of interest to both the user(s) and the
17
18 observers. Drawing upon field observations and video recordings of visitors' verbal and
19
20 bodily conduct, this paper explores the social organization of visitors' 'performances' that
21
22 arises at the exhibit face and adds to recent debates that point to the importance of social
23
24 interaction and conversation within the visitors' experience of exhibits (cf. Leinhardt,
25
26 Crowley, & Knutson, 2002; Rennie, Feher, Dierking, & Falk, 2003). In so doing, we wish to
27
28 put forward the argument that shared experiences in the form of performative activity can
29
30 both create and sustain visitor engagement at computer-based exhibits.
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41 **Background**

42
43 Imagine being charged, as was the Science Museum, London, with creating an
44
45 interactive gallery targeted at children aged 7 to 14 to support science education around the
46
47 socio-scientific issues associated with energy and its use. From an educational perspective,
48
49 this is a challenging task as energy has proven to be a complex subject to teach. Research
50
51 within the constructivist movement on teaching and learning provides significant evidence
52
53 that students hold a range of alternative conceptions of energy (cf. Brook, 1986; Pfundt &
54
55 Duit, 1991). The students' difficulty is, perhaps, understandable considering that although
56
57 one can sense energy in the form of light or heat, explanations or even samples of the
58
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1
2
3 phenomena are unavailable within everyday experiences. As such, a tangible material, such
4
5 as water, might be used to describe energy – a substance not easily obtainable for inspection
6
7 without complex tools. For example, for electricity, the metaphor emerging from the
8
9 comparison could then liken the flow of electrons to a stream of water (Harré, 1986: 76).
10
11

12
13 In addition to the difficulty of making sense of an abstract concept like energy, the
14
15 main remit of the Energy Gallery – to discuss socio-scientific issues surrounding energy –
16
17 furthers the distance between the topic and the macroscopic world. Whereas physical
18
19 phenomena – like forces and even energy transfer – can be displayed through
20
21 decontextualised mechanical interactive exhibits that allow visitors to explore the properties
22
23 of both the exhibits and the phenomenon simultaneously, socio-scientific issues necessitate a
24
25 different sort of exhibit medium (cf. Bradburne, 1998; Pedretti, 2002). Pedretti (2004)
26
27 suggests that
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29
30

31 [c]onventional installations often convey science as void of any social cultural
32
33 context, and negate raising questions about the status of scientific knowledge. A more
34
35 authentic portrayal acknowledges the tentativeness and purposefulness of knowledge
36
37 creation, and views science as a human and social activity. (p. S36)
38
39
40

41 She argues that exhibits should be designed to ‘enhance learning by personalizing
42
43 subject matter, evoking emotion, stimulating dialogue and debate, and promoting reflexivity’
44
45 (p. S45). She provides examples of two exhibitions both of which employ simulations, either
46
47 multimedia or theatre, as tools to engage visitors. The Energy Gallery, in London, which is
48
49 almost entirely comprised of computer-based interactives, appears to correspond to Pedretti’s
50
51 concept in its intended approach to tackling the chosen subject matter. Exhibits in this gallery
52
53 range from simulations – one of which places visitors in charge of balancing politics, natural
54
55 resources, the economy and the impact on the environment to meet the energy needs of an
56
57 imaginary country – to a physical experience which aims to shock (literally) visitors into
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1
2
3 reflecting on the balance between the necessity and yet physical danger of energy. Thus,
4
5 considering the general attitude of the target audience towards science and the difficulties
6
7 inherent in the nature of the subject, there are two key questions: What are the appropriate
8
9 media to convey such content? And, what are the desired behaviours to encourage
10
11 engagement with the exhibits?
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14
15 It appears that as the focus within museums on such issue-based topics grows, so does
16
17 the prevalence of computer-based interactive exhibits that might, for example, simulate
18
19 scenarios and environments (Pedretti, 2004). Gammon (2005) suggests that computer
20
21 interactives can be a useful medium when one wants to deliver large quantities of information
22
23 in an appealing and accessible manner under the control of the visitor, or to allow visitors to
24
25 experience and experiment with environments possible only through the use of multimedia
26
27 digital simulations. Within a range of literature, various methods of investigating engagement
28
29 with computer-based interactives has emerged, from those within visitor studies (cf. Dierking
30
31 & Falk, 1998; Economou, 1998; Sandifer, 2003), to evaluations from within the museums
32
33 (cf. Gyllenhaal & Perry, 1998; Haywood & Burch, 2005; McIntyre, 2003), to studies from
34
35 research in science education (cf. Eberbach & Crowley, 2005; Stevens & Hall, 1997).
36
37 Sandifer (2003), for example, suggests that exhibits displaying technological novelty and
38
39 open-endedness showed increased average holding times. That is, such exhibits not only
40
41 attract the attention of visitors, but they contribute to the exhibit's success at keeping
42
43 individuals engaged in the activity.
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51 Because this paper focuses not just on whether visitors engage with computer-based
52
53 interactives but on the details of that engagement, previous studies exploring how computer
54
55 exhibits can mediate learning become relevant. Unfortunately, relatively few studies
56
57 investigate how computer-based interactives feature in the social interaction of visitors. One
58
59 such study suggests that people like to gather around and examine computer exhibits
60

1
2
3 collaboratively (Flagg, 1994). Another provides evidence that a computer animation of plant
4
5
6 pollination generates more conversation (and specifically talk about processes within the
7
8
9 plant) between visitors than does a live plant (Eberbach & Crowley, 2005). While these
10
11 studies have made an important contribution to our understanding of the impact of computer
12
13 systems on visitors' experience of exhibits, they provide relatively little detailed information
14
15 on how computer-based interactives are used in social interaction. Heath, vom Lehn and
16
17 Osborne (2005) investigate how stationary touch-screen systems affect the ways in which
18
19 people explore and make sense of exhibits. Their findings suggest that such exhibits often
20
21 limit the emergence of more complex forms of collaboration and co-participation at the
22
23 exhibit face. The research to be presented in this article aims to build on such work but with a
24
25 focus on investigating the details of action and interaction at computer-based exhibits that
26
27 employ a range of user interfaces, and how such exhibits might open-up possibilities for
28
29 greater social interaction.
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33
34 With the growing focus on socio-cultural learning as one of the primary modes of
35
36 learning within informal science institutions (Rennie, Feher, Dierking, & Falk, 2003), social
37
38 interaction and collaboration have recently been highlighted by a large number of studies.
39
40 The majority of such research focuses on how social interaction within family and school
41
42 groups enhances an individual's learning (cf. Blud, 1990; Borun, Chambers, & Cleghorn,
43
44 1996; Diamond, 1986; Dierking & Falk, 1994; McManus, 1988). Many studies highlighting
45
46 the importance of social interaction place a strong emphasis on the role of conversation and,
47
48 in particular, learning conversations (cf. Ash, 2003, 2004; Crowley & Callanan, 1998;
49
50 Gelman, Massey, & McManus, 1991). However, conversation is but one form of social
51
52 interaction occurring at the exhibit face. A few researchers (cf. Carlisle, 1985; Lucas &
53
54 McManus, 1986; Puchner, Rapoport, & Gaskins, 2001; Weier & Piscitelli, 2002) have begun
55
56 to make note of the existence of non-verbal behaviours in interactive galleries. Yet, except
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1
2
3 for a few examples (cf. Diamond, 1986; Rahm, 2004), little analytic attention has been given
4
5
6 to how people's talk is interwoven with their bodily and material conduct.

7
8 This paper draws on recent research concerned with the ways in which people
9
10 experience computer-exhibits in and through social interaction. Yet, rather than focusing on
11
12 talk and conversation, it focuses on a form of social interaction and participation that we see
13
14 as being performative in nature. That is, in using all types of exhibits in science centres and
15
16 museums, visitors press buttons, turn cranks, touch touch-screen displays and point at
17
18 objects. Their activities might go unnoticed by others. However, it is becoming increasingly
19
20 recognised that visitors take notice of or even study the actions of others in order to make
21
22 sense of certain aspects of an exhibit and its functioning. For example, Heath, Luff, vom
23
24 Lehn, Hindmarsh and Cleverly (2002) discuss how people discover the functionality of an
25
26 interactive art installation through their interaction with others nearby. And, as is
27
28 demonstrated in vom Lehn, Heath and Hindmarsh (2001), visitors negotiate access to exhibits
29
30 based on their interactions with others at the interactives. Here, we build on this work but
31
32 concentrate specifically on the individuals who are being 'watched' by others – those who
33
34 are, in essence, the performers.

35
36 More specifically, we are interested in the design and function of performative
37
38 activity, and how individuals might create an unfolding performance that communicates
39
40 aspects of their actions to others. There has been a long-standing interest in the social
41
42 sciences to treat human conduct and interaction as performance. The early work of Goffman
43
44 (1959) is perhaps exemplary in this respect. In this paper, we adopt a different standpoint.
45
46 Rather than treating all action as performance, we build on Turner's (1986) work which
47
48 directs attention to the ways in which the participants themselves differentiate 'doing
49
50 something' from displaying or performing. Thus, through this paper we seek to provide
51
52 insight into the following questions: What does performance look like at a computer-based
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3 exhibit? How might aspects of the immediate environment, including the affordances of the
4
5 physical design of the exhibit and interactions with other individuals present, shape the
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7 activity into a sequence of organised actions, or indeed, a performance? And, what are the
8
9 ways in which actions are fashioned that enable other individuals to become aware of and,
10
11 perhaps, part of the activity?
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17 **Methodological Considerations**

18
19 As Erickson (1992: 202) suggests, ethnographic research of educational settings is
20
21 increasingly concerned with ‘identifying and documenting the processes by which
22
23 educational outcomes are produced’ (Erickson, 1992: 202). Ethnographies of schools,
24
25 museums and the like, shed light on how individuals within those settings go about creating
26
27 the context of the educational environment and generating specific outcomes. However, as
28
29 Erickson suggests, within such ethnographic research there is a growing concern that because
30
31 of the habitual and situated nature of many of the activities that occur, both practitioners and
32
33 researchers often overlook the details of educational practices. For example, whereas more
34
35 traditional ethnography often claims an understanding of the intention and meaning of
36
37 participants’ actions, it can disregard the practices in and through which social interaction is
38
39 accomplished – practices that underpin education both in formal and informal environments
40
41 (Erickson, 1992: 204). In this regard, there is a growing interest in unpacking the fine details
42
43 of conduct and interaction, and drawing on resources such as video recordings to address the
44
45 particulars – the talk, bodily and material conduct – of the situated, collaborative
46
47 accomplishment of activities within learning environments.
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55 The systematic inspection of video data requires a framework to manage the analysis
56
57 of its complexity. In the recent past, various analytic frameworks have been employed to
58
59 examine people’s conduct and interaction in formal and informal educational settings (Lucas
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1
2
3 & McManus, 1986; Roth, in press; Tunnicliffe, 2000; von Aufschnaiter, 2003). Our own
4
5 research utilises methodological developments within the social sciences which are
6
7 concerned with the situated character of practical action (cf. Goffman, 1959, 1981; Garfinkel,
8
9 1967; Sacks, Schegloff, & Jefferson, 1973; C. Goodwin, 1981; Erickson 1992). More
10
11 specifically, we draw on ethnomethodology (cf. Garfinkel, 1967; Heritage, 1984) and
12
13 conversation analysis (cf. M. H. Goodwin, 1990; Heritage, 1997; Sacks, 1992; Sacks,
14
15 Schegloff, & Jefferson, 1974) in conjunction with Goffman's (1959, 1963, 1981) insights on
16
17 face-to-face interaction. Together, these perspectives provide the methodological and analytic
18
19 framework to address the conduct and interaction of visitors with and around exhibits in
20
21 science centres and museums.
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27 Our framework is concerned with taking the participants' perspective seriously by
28
29 examining their actions and activities as they arise, and exploring how visitors organise their
30
31 conduct and experience in interaction with others (Heath, 2004; vom Lehn & Heath, in press)
32
33 – both those they are with and those who just happen to be within 'perceptual range of the
34
35 event' (Goffman, 1981). Video recordings, augmented by fieldwork, provide important
36
37 analytic resources in this regard. They enable repeated and detailed access to the conduct and
38
39 interaction of participants, and more specifically, the interplay of talk, bodily and material
40
41 conduct and the ways in which the visitors' engagement with exhibits contingently arises
42
43 both in and through their emerging interaction with others. We subject the video recordings
44
45 to detailed scrutiny to uncover how action and interaction emerge from and are part of the
46
47 context in which they are occurring. Here, 'context' refers not only to the physical
48
49 environment but to the unfolding nature, or moment-by-moment production, of the activity
50
51 that arises (Heath & Luff, 2000).
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57 The data, including the video recordings, field observations and discussions with staff
58
59 and visitors, have been gathered at the Energy Gallery at the Science Museum in London – a
60

1
2
3 computer-based exhibition designed to facilitate engagement and discussion of socio-
4
5 scientific issues by engendering a variety of forms of activity with and around the exhibits.
6
7
8 The gallery is targeted at a school-aged audience but as a public exhibition attracts a wide
9
10 range of visitors. Altogether we have collected approximately 20 hours of video data and a
11
12 substantial corpus of field observations recorded both on weekday afternoons and on
13
14 weekend days. The filming days were chosen to ensure that there would be a variety of types
15
16 of visitors within the gallery - including families, groups of friends, and some scout troops.
17
18

19
20 The analysis involves the detailed transcription of short fragments of video – single
21
22 instances of discrete phenomena, here, visitors' performative activities – including
23
24 participants' talk and bodily comportment. (For sample transcript and notes on transcription,
25
26 see Figure 4.) By comparing and contrasting characteristic actions and activities among
27
28 various fragments, we begin to identify the patterns and organization of the conduct and
29
30 interaction. In common with more traditional ethnography, the fragments discussed in this
31
32 paper have been selected because they provide particularly clear instances which are used to
33
34 reflect upon the more common themes that we explore (Heath, 2004; vom Lehn & Heath,
35
36 2004, in press).
37
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39

40
41 Recording video data in science centres and museums raises certain practical and
42
43 ethical issues. It is argued that when being filmed people inevitably react to the camera,
44
45 rendering the data unreliable (Gottdiener, 1979). Yet, research in museum studies shows that
46
47 that video recording is less obtrusive than field observation and reduces the reactivity to
48
49 observational methods (Morrissey, 1991; Phillips, 1995). Both in undertaking field
50
51 observation and video recording, we like other field researchers (C. Goodwin, 1981;
52
53 Grimshaw, 1982; Harper, 1994), are highly sensitive to our part within and influence on the
54
55 scene. We take precautions to both reduce 'reactivity' and assess data for the influence of the
56
57 recording. For the present study, the camera was separated from the action by mounting it to
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1
2
3 a wall or attaching it to a tripod some distance from the exhibit itself. Once set up, the camera
4
5 was set to record the action with the researcher only returning in order to change tapes. Very
6
7 few visitors glanced at the camera and even fewer pulled faces, waved or otherwise
8
9 observably responded to the camera (see also Hensel, 1987 for similar findings).
10
11

12
13 To address ethical issues of undertaking video recording in a public area, we placed
14
15 notices at the entrances to the gallery to inform visitors and secure their support. The notices
16
17 explained the purpose of the project and that data would be used only for research and
18
19 teaching purposes. We also provided visitors with the opportunity to refuse to be recorded
20
21 and offered them the opportunity to have the recordings destroyed if they had any
22
23 reservations after the event. A number of visitors approached either the researcher or a
24
25 member of the museum staff to discuss the nature of the project further, but no visitors
26
27 showed any reluctance to being recorded; indeed many were interested in the research. All
28
29 procedures were agreed with the museum staff before filming began and were conducted in a
30
31 similar manner to those described in studies conducted by Gutwill (2002, 2003) which
32
33 explored the assumptions underlying such a method of gaining implicit consent at a museum
34
35 exhibit.
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44 **Analysis of Performative Activity at the Exhibit Face**

45 *'Doing' and 'Displaying Doing'*

46
47
48 The commonplace understanding of a performance is one in which the activities
49
50 displayed – the talk and bodily action – are scripted and prepared, and typically undertaken
51
52 for the entertainment of an audience (Schechner, 2002). However, within the social sciences,
53
54 some have broadened such a perspective to include notions of 'everyday' performances. For
55
56 example, in viewing performance as a metaphor for all social action, Goffman (1959) offers
57
58
59
60

1
2
3 insight into the ways individuals might produce unscripted performances to manage the
4
5 impression they project of themselves. And, rather differently, by developing the concepts of
6
7 ‘theatricality’ and ‘performativity’, cultural anthropologists have highlighted the
8
9 communicative function of the aesthetic quality of everyday actions (Hymes, 1974; Turner,
10
11 1986; Willems & Jurga, 1998).
12
13

14
15 The designers of the Energy Gallery aspired to engender a variety of forms of
16
17 participation and engagement. In so doing, they sought to create exhibits that might engage
18
19 not only the principle user but also those visitors who might gather around and observe the
20
21 activity. The following fragment offers insight into how such activity might arise at the
22
23 exhibit face in the form of performative activity. It has been recorded at an exhibit entitled
24
25 *Making Energy Useful*. The exhibit challenges visitors to a game in which iconic
26
27 representations of energy resources, such as coal or wind, slowly fall down on the screen (see
28
29 Figure 1). As they reach the bottom, they pass through one of three boxes representing ways
30
31 of converting the resources into useful forms of energy – for example, one box might
32
33 represent a wind turbine. Each of the three boxes corresponds to one of three footpads on the
34
35 floor in front of the screen. Visitors try to catch the falling energy resources by stepping on
36
37 one of the footpads and activating the box on the screen. If they are successful in catching the
38
39 resource with the correct capture mechanism, it is converted to useful energy and they receive
40
41 a point.
42
43
44
45
46
47
48
49

[Insert Figure 1 about here]

50
51 We join the action while Mark is in the midst of the game (see Figure 2). He taps the
52
53 footpads with his feet and alternates the direction of his gaze between his feet and the screen.
54
55 In so doing, he attempts to coordinate his actions on the footpads with those on the screen,
56
57 responding both to the images presented, and his own successes and failures. Mark first steps
58
59 on the footpads, one-by-one, and monitors the system’s response. As he recognises the
60

1
2
3 organization of the game he uses it to transform his actions to a dance, choreographed by the
4
5 game's structure and his attempts to complete it successfully. His actions are elaborate and
6
7 embellished, going beyond the simple movements required to interact with the exhibit.
8
9 Playfully and with finesse, he moves his feet across the footpads and raises his arms as if
10
11 dancing to music.
12
13

14
15 [Insert Figure 2 about here]
16

17 He repositions himself quickly and dramatically, using large gestures and bodily
18
19 movements. His pauses in action are momentary and infrequent. He jumps between stances,
20
21 reorienting his body to reach the various footpads more effectively. He incorporates his arms
22
23 as much as his legs into his action, often with his fingers widely spread. Mark concludes the
24
25 sequence of activities represented above with a smile – not a pause in action, but an
26
27 acknowledgement of enjoyment of his own activity. Here, his smile displays that his activity
28
29 is one that both accomplishes its goals and is fun or interesting. His performance is not only
30
31 enjoyable to execute but may also be interesting to watch. His neatly organised activity goes
32
33 beyond the pragmatic aspects of actions produced to accomplish a task. That is, the aesthetic
34
35 qualities of his actions – the visible and accountable phenomena that other people can see and
36
37 orient to – become a critical part of their accomplishment in the public environment of the
38
39 exhibition (Knoblauch, 1998).
40
41
42
43
44

45 Unlike the behaviour we see from Mark, some visitors are aware that they are acting
46
47 in a public space where others might pay attention to their activity. When they have figured
48
49 out what an exhibit does, they may utilise the exhibit in a way that highlights the
50
51 performative aspects of their actions in order to create an experience for other participants.
52
53 And, in so doing, they develop techniques that may make their activity with and around a
54
55 computer system interesting for others to watch. To explore this notion, let us consider
56
57 another fragment that has been recorded at an art installation in the centre of the gallery
58
59
60

1
2
3 entitled, *Do Not Touch*. The exhibit consists of a tall metal pole standing inside concentric
4 circles painted on the floor along with the words 'Do Not Touch' (see Figure 3). When
5
6 visitors approach the pole and hold their fingers to the metal bars in the centre, they get a
7
8 slight electric shock. The physical experience, which is accompanied by a loud zapping noise
9
10 audible across the gallery, is intended to provide visitors with an appreciation of the physical
11
12 power of energy and to engender a range of responses to it.
13
14

15
16
17 [Insert Figure 3 about here]
18

19
20 The fragment begins as Carol, a mother who has previously experienced the electric
21
22 shock given by the pole, encourages Vivian, the grandmother, to play a trick on their family.
23
24 She instructs Vivian on where to touch the pole and how to react as if she has been shocked.
25
26 With her family situated just off-camera in a location that might be considered front row,
27
28 stage right, Vivian designs her activity (see Figure 4) to obscure any clear view they might
29
30 have of her touching the pole.
31
32

33
34 [Insert Figure 4 about here]
35

36
37 With her body blocking their visual access to the 'active' area of the pole, Vivian
38
39 leans in towards the pole and asks Carol to check whether the rest of the family are watching.
40
41 As Carol confirms that the family is looking, Vivian glances briefly at her audience before
42
43 returning her gaze to the pole. Allowing them no time to make sense of her actions, as soon
44
45 as her finger hits the metal she exclaims, 'Oh', while pulling her finger away from the pole as
46
47 if having just received an electric shock. She holds her finger with her other hand and
48
49 displays an experience of pain. As she clutches her 'hurt' hand, Vivian and Carol turn
50
51 simultaneously towards the rest of the family. Carol smiles at her family as Vivian produces
52
53 further sounds of pain. Then, with a slight smirk and one quick wink at the family, Vivian
54
55 concludes her performance (see Figure 5).
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58
59 [Insert Figure 5 about here]
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3 Vivian's actions are designed to create an experience for her family by demonstrating
4 a suffering that never was. She displays the pain and surprise of having received an electric
5 shock, although, as evidenced from a lack of zapping sound emitted from the exhibit, she
6 never did. Vivian's response to having been 'shocked' is fairly believable – following a slight
7 exclamation, she pulls her finger from the metal and grabs hold of her hand. One might
8 imagine doing the very same thing upon receiving a mild shock. In fact, countless examples
9 of other visitors getting an actual shock reveal that her actions are not out of the ordinary.
10 Oddly though, Vivian never turns to look at the offending object. Rather she and Carol turn
11 towards their family – Vivian holding her hand and Carol smiling, thus revealing that
12 Vivian's 'doing' was a performance to kindle a reaction from the others. While one might
13 take Vivian's wink as assurance that she has survived the pain of the shock, the other
14 elements of her immediate display give credence to the idea that she is acknowledging her
15 own performance – the trick she has played on the family.
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34 The two fragments reveal how performative activity arises in the Energy Gallery. The
35 visitors create elaborate and embellished actions with and around the exhibits – activities that
36 can be characterised as 'performances'. Such performances are produced in the moment at
37 hand. The 'performers' not only use the exhibits but also create engaging and enjoyable
38 experiences, both for themselves and those observing them. Mark transforms the systematic
39 tapping of the footpads into a dance that he himself, as well as others observing his action,
40 might enjoy. The dance, while primarily produced for pragmatic purposes, namely the
41 successful completion of the game, also provides Mark with an enjoyable experience.
42
43 Vivian's performance is of a different kind – she designs her actions to create an engaging
44 experience for her family by producing performative actions that attract their attention to the
45 pole. Thus, the analyses show how performances can be an effective means to support and
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3 enhance the experience around and understanding of an exhibits' functionality, not only for
4 those using the exhibits but also for those observing the activity.
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10 *Drawing an Audience*

11
12 Exhibits are often designed to be attractive to visitors, to draw them in to take a closer
13 look, or possibly even become physically engaged. Designers work with a range of
14 approaches. For example, they might create an exhibit casing that is large and colourful, or
15 they might depend literally on an exhibit's bells and whistles – the sounds it makes – to
16 provide the necessary draw. As such, many designers consider an exhibit's attractiveness to
17 be built in to the design of the exhibit and its environs (Bitgood, 1991, 1994; Shettel, 1973).
18 Perry (1989, 1993), for example, conducted considerable research to create a model for
19 designing intrinsically motivating exhibits. There is also a small body of research which
20 suggests that the 'social influence' created by the presence of other people at an exhibit might
21 affect the visitors' experience at the exhibit (Bitgood, 1993). Various studies reveal how
22 individuals work to draw their companions' attention to exhibits, for example, by calling
23 them over and posing questions (cf. Diamond, 1986) or by modelling effective exhibit use (J.
24 Koran, M. Koran, Foster & Dierking, 1988). While the latter study showed that modelling
25 does indeed influence visitor activity, the models involved were museum staff rather than
26 visitors engaged in more natural or spontaneous activity. Despite the existing literature, we
27 still know relatively little about how people may be drawn to exhibits by virtue of other
28 visitors' actions with and around them.
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52 Consider the following fragment recorded at *Energy Everywhere*, a large-screen
53 computer interactive intended, as the name suggests, to illustrate that energy is all around us.
54 Visitors trigger various energy transformations by mimicking the actions of an on-screen
55 silhouetted figure, for example, clapping to make lightning strike a tree (see Figure 6).
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3 Visitors can see on the screen a representation of energy transferred among a variety of
4
5 forms, ranging from kinetic energy to potential energy to light, heat and sound.
6
7

8 [Insert Figure 6 about here]
9

10 We join the action as three children – Patrick, Christina and Nicholas – face the
11 screen where a silhouetted figure of an individual raising her hands to clap appears along
12 with the words ‘clap your hands to make lightening strike’ (see Figure 7). As Christina
13 begins to lift her hands into a clapping position, Patrick and Jackie, the children's adult,
14 simultaneously read the text aloud. A moment later, Christina and Patrick start clapping.
15
16 Nicholas stands nearby and looks towards the 'energy square' drawn on the floor - the spot
17 where visitors are instructed to stand to make the exhibit function properly. He steps in front
18 of the other two children, squats down and begins to clap. The on-screen display zooms to
19 present a tree, a cloud and the prompt – 'Start clapping! Try to hit the tree!' As such, the space
20 – including the energy square on the floor and the screen in front of the children – occasion
21 how the children arrange themselves and begin their performance.
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36 [Insert Figure 7 about here]
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38 Because the exhibit is designed to be open on both ends, people often pass through
39 the gallery, and even the exhibit, without noticing it. Yet, when the exhibit is occupied it can
40 draw the attention of individuals who happen to be simply walking past. Let us return to the
41 fragment as the three children are clapping in unison and lightening bolts begin to form from
42 a cloud moving about on the screen. Their accompanying adult, Jackie, leans against the wall
43 to observe the unfolding events. Lightening bolts strike the tree twice before the tree
44 explodes. Fractions of a second before the bolt hits the tree a visitor, James, who does not
45 know Jackie and the children, comes into view from behind the screen. He appears to be
46 walking past the exhibit with his gaze turned away from the action.
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3 After a few moments, he notices the children clapping and looking at the large screen.
4
5 While slowly walking ahead James turns his head to the children to see what they are doing
6
7 and what the spectacle they are creating involves (see Figure 8). Upon hearing Christina
8
9 exclaim, 'yeah, we got the tree', James rapidly shifts his gaze towards the screen before
10
11 turning once again back to the children. Taking a final step towards the wall behind the
12
13 exhibit, he again looks to the side where he can see the children's actions and the events on
14
15 the screen.
16
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19

20 [Insert Figure 8 about here]
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22 As the action continues and James stops, one of the three children – Patrick – lowers
23
24 his hands, stops clapping, exclaims, 'ah, that's better' and takes to rubbing his seemingly sore
25
26 palms on his thighs. Nicholas, the child in the middle, quickly follows suite and steps out of
27
28 the centre – out of the 'energy square' – to form a line with the others in order to watch what
29
30 might happen next. Just as the last child, Christina, produces one final clap, James turns his
31
32 head away from the activity and begins to take his leave.
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36 The fragment begins to reveal how visitors' activity with and around exhibits can be
37
38 appealing to others who just happen to pass by. The children's embellished actions, their
39
40 audible clapping and gross gestures in front of the large screen, are produced to play the
41
42 game. However, such activity also kindles a stranger's interest in the exhibit and thus
43
44 generates an audience to the activity. The children's actions provide their audience with an
45
46 understanding of both how the exhibit works and what it might be about. That is, members of
47
48 the spontaneous audience - including both Jackie and James – are afforded the opportunity to
49
50 view the on-screen information about the energy cycle and engage, even if only superficially,
51
52 with the exhibit content. As such, the analysis shows that performative activity can
53
54 inadvertently draw individuals, including complete strangers, to an exhibit and allow them to
55
56 observe how others engage with and respond to the exhibit. Accordingly, the attractiveness of
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3 an exhibit is not only embodied within its physical design, but rather it emerges contingently
4
5 along with the visitors' activity. That is, the social influences created through the elaborate
6
7 and embellished design of the visitors' actions both attract others to the exhibit and provide
8
9 them with resources to make sense of the exhibit's functionality.
10
11

12 13 14 15 *Sustaining Engagement*

16
17 Exhibition designers, managers and evaluators are often concerned with individuals'
18
19 engagement with exhibits. They seek answers to questions such as - do they stop at an
20
21 exhibit? Do they spend considerable time with it? And, do they understand what the exhibit is
22
23 about? For example, researchers and exhibit designers at the Exploratorium in San Francisco
24
25 collaborated on a project in which they sought to design exhibits that foster 'Active
26
27 Prolonged Exploration' (Humphrey & Gutwill, 2005). Essentially, their work investigated
28
29 what might keep visitors at an exhibit for an extended amount of time and how exhibits could
30
31 be designed to engender such behaviour. In general, however, research on visitors' responses
32
33 to exhibits largely focuses on the relationship between an exhibit and its viewer or user
34
35 (Shettel, 2001). Indeed, relatively little is known of how people try to keep their companions'
36
37 attention at an exhibit through the ways in which they design their own activity.
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43 Consider the following fragment, again recorded at the *Energy Everywhere* exhibit.
44
45 We join the action after Sarah has managed to draw the attention of her sister, Rosemary, and
46
47 then her mother, Carol, to the exhibit (see Figures 9 and 10). When Rosemary begins to
48
49 disengage from the exhibit Sarah and Carol use the display on the large screen as a resource
50
51 to produce a performance that draws Rosemary back in and sustains her orientation to the
52
53 exhibit. Carol's utterance – 'Ah, it's the sun shining on us. Can you feel it? – occasions her
54
55 daughters to orient to the screen. Sarah confirms her mother's feeling of the warmth and says,
56
57 'Ah I'm so warm'. Carol responds by saying, 'Ah, I'm so hot I need to put my knickers on
58
59
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1
2
3 and nothing else'. Thus, Carol and Sarah create a theatrical dialogue and turn-by-turn
4
5 performance that engages Rosemary with the exhibit.
6
7

8 [Insert Figure 9 about here]
9

10 [Insert Figure 10 about here]
11

12
13 However, despite Carol's efforts, Rosemary takes to fidgeting a bit. Sarah prompts
14
15 Rosemary to respond to the performance with an expression of dislike for the heat from the
16
17 pretend sun. She shakes Rosemary's arms back and forth providing her with a physical cue
18
19 to engage. Rosemary responds by mimicking the sound her sister has made. The girls'
20
21 responses are fashioned by the nature of the pretend atmosphere Carol has created – a hot
22
23 environment where the fewer clothes one wears, the better. Carol, perhaps encouraged by the
24
25 girls' responses, further develops her performance. She declares her intended action by
26
27 proclaiming that she is about to take off her clothes (see Figure 11). Then, she moves to what
28
29 is essentially centre stage – a position where anyone looking at the screen would also see her
30
31 actions. She places her hands on her hips and stares directly at Rosemary to check her
32
33 attentiveness to the performance. After Sarah produces a noise of disgust, Carol moves her
34
35 hands towards the fly of her jeans and pretends to unbutton her trousers. Sarah physically
36
37 prompts Rosemary to respond by shaking the younger girl's arms, which are by now raised
38
39 above her head. With her trousers still on, Carol then steps back into her original position.
40
41 David, the father, who had been watching attentively from the side, turns his gaze away from
42
43 Carol and back towards the screen. In so doing, he marks the silent end to her performance.
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49

50 [Insert Figure 11 about here]
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52
53 As the performance concludes, both Rosemary and Sarah respond one last time with
54
55 exclamations of disgust. While it is not clear whether the girls are responding to their dislike
56
57 of being hot or the image of their mother without clothes, there is little doubt that their
58
59 responses are derived from the performance displayed. That is, both being hot and watching
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1
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3 Carol remove her clothes are ideas occasioned by the performance itself. More specifically,
4 we have seen each of Sarah's responses following on sequentially from Carol's prompts
5 and/or displays. Rosemary's responses tend to follow in turn from both Sarah's own
6 statements and a physical provocation from her older sister. The performance reaches an
7 ultimate conclusion as Carol verbally directs the focus of attention from herself back to the
8 activity on the screen – the fact that the tree begins to glow with warmth. She returns to her
9 very first (and previously unnoticed by her family) action of reaching her arms out towards
10 the screen, as if warming her hands in front of a fire. Sarah responds as though the
11 performance might continue by stating, 'Mummy's gonna get warm – it looks like we may
12 have ta, might have ta...'. Sarah looks down at Rosemary, and Carol looks at David. Their
13 father calls the activity to an end by questioning the exhibit itself, which is still cycling
14 through its narrative, by asking 'What is this?' Although the girls might be willing to
15 continue the activity longer, first Carol, and then David, turn to leave the exhibit.
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34 The fragment shows how people can use aspects of an exhibit as resources to create a
35 performance for others. The performance is not scripted but ongoingly and contingently
36 produced in the interaction between the participants. In this case, Carol uses the display on
37 the screen as a resource to build a performance that is engaging for her daughters. When
38 Sarah joins into her mother's performance, Carol's actions become increasingly lively and
39 animated; she moves in front of the screen facing the girls and her husband. She then acts out
40 the feeling of the warmth of the sunshine while her family view the performance and
41 occasionally respond to it. By choosing to design her activity around everyday conceptions of
42 energy and the sun's heat, Carol's strategies to kindle both the audience's interest and
43 response to her actions prove to be an effective way of sustaining her family's attention.
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58 The analysis reveals how visitors may design their activity – their performance – to
59 engage their companions. Like street performers (Mason, 1992; McIlvenny, 1996) museum
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3 visitors appear to know how to draw and hold others' attention with their actions. They can
4
5 differentiate between attentive and inattentive audience members, and even re-engage those
6
7 becoming disinterested with the activity. As evidenced by the fragment presented, such
8
9 performances are characterised by a spatial and temporal arrangement, where the physical
10
11 structure of the exhibit helps to obtain and organise the audience. For example, the outer-
12
13 shell of the exhibit and the necessary arrangement of people in front of the screen act as
14
15 guides for appropriate viewing locations for audience members. By choosing particular
16
17 positions with regards to others, the performers can both configure an audience and
18
19 orchestrate their experience with the activity. This performative activity can bring exhibits to
20
21 life through, for example, the performer's embodiment of actions – seen here in the way
22
23 Carol demonstrates the effect of the heat of the pretend sun on her own body. In essence,
24
25 performative activity at the exhibit face may serve to enhance and sustain engagement with
26
27 the content communicated by the physical objects.
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36 Discussion and Implications

37
38 Building onto current debates on informal learning and visitor behaviour, this paper
39
40 examines performative activity that arises in the setting of an informal science experience,
41
42 namely the Energy Gallery at the Science Museum in London. It reveals that visitors may
43
44 knowingly or unknowingly exploit certain design features – such as multiple interfaces, large
45
46 screens and the various spaces around exhibit components – to configure their actions in
47
48 elaborate and embellished, and thus more noticeable, ways that can attract and hold other
49
50 people's attention with the exhibit. Such performances may bring to light both how an exhibit
51
52 works and what it is about, and as such, might become 'talking-points', occasioning the
53
54 verbal forms of social interaction which are increasingly considered to be critical resources in
55
56 shaping people's experience of and learning from exhibits (Leinhardt, Crowley, & Knutson,
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1
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3 2002; Leinhardt & Knutson, 2004; Tunnicliffe, 2000). Indeed, the performances themselves
4
5 can mediate the relationship between the exhibit and the audience.
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7

8 Like conversation – the more commonly studied form of social interaction at exhibits
9
10 – performance is both a way for individuals to create shared experiences and a form of shared
11
12 experience itself. However, performance allows individuals to share a seemingly private
13
14 experience in a way that conversation cannot. For example, in merely following the
15
16 directions on a computer screen to make lightning strike down a tree as in *Energy*
17
18 *Everywhere*, visitors passing by are able to ascertain how the exhibit works and, perhaps,
19
20 even some of the intended content. In addition, we would suggest that having shared
21
22 experiences, like those created through performative activity, open future possibilities for
23
24 conversation. Such experiences might form the basis for conversations visitors may conduct
25
26 later during their visit or at home (Crowley, 2000; Ellenbogen, 2002; Haywood & Burch,
27
28 2005)
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34 Visitors who are drawn to a performance, and therefore an exhibit, assemble as an
35
36 audience to the action. Members of such audiences can regulate their degree of interaction
37
38 with the performance by, for example, selecting where to stand – specifically, how they
39
40 situate themselves around physical barriers such as walls and other people. Together the
41
42 audience and the performer(s) create a dynamic environment. Similar to more traditional
43
44 performances, at times the performer(s) at the exhibits might undertake considerable work to
45
46 sustain the separation between themselves and their audience. For example, they might
47
48 protect their space from possible audience participation by physically moving out of range or
49
50 by treating their audience as spectators, and in fact calling them as such (cf. Becker, 1951;
51
52 McIlvenny, 1996). Conversely, performers, like Carol and Vivian, might desire audience
53
54 response and participation. Indeed, we saw earlier how the two women fashioned their
55
56 activity around the physical location and response of their intended audience.
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In a similar way that the analysis has attempted to unpack the tacit nature of performance as a form of participation, it has also begun to lead to a more detailed understanding of the role observation plays in creating shared experiences. Through the analysis we begin to see the manner whereby individuals observe, and sometimes even purposefully deviate from their intended path, for the benefit of watching another person's activity. Such behaviour is reflective of Rogoff et al.'s (Rogoff, 2003; Rogoff, Paradise, Arauz, Correa-Chavez, & Angelillo, 2003) notions of intent participation – a term coined to focus on a particular way in which individuals learn through inspection. Of critical importance for the type of observation exhibited within intent participation is that the children intend to participate in the activity that they are witnessing. The children listen in and observe of their own initiative and actively join the activity in their own time. In so doing, they change participation status from being an active observer to a full collaborator in the activity. In this sense Rogoff (2003: 178) focuses on 'observation as an aspect of participation', not something that occurs only prior to participation.

While the thoughts on observation made throughout this paper have much in common with aspects of intent participation, they attempt to further the understanding of what it truly means to observe – to attend to another's activity – and how individuals might configure their activity for observation. That is, the fragments offer details such as how the specific manner in which one's gaze follows another's activity allows for the communication of information about exhibit usage. Or, at what point within an individual's observation he or she might desist from watching, or solely watching, and begin to engage in the activity. The fragments also show how performers, knowingly or unknowingly, design their activity for the benefit of those observing their actions.

Shared experiences, and in particular performative ones, appear to be an effective means to create engagement and participation with museum exhibits and, subsequently

1
2
3 perhaps, the scientific issues they contain. While we note that considerable interest within
4
5 this paper has focused on the socio-scientific content and novel interfaces of the exhibits
6
7 studied, we do not wish to suggest that the performative activity observed results from the
8
9 specific exhibit content. Rather, our interest in the content at hand lies in the ability of the
10
11 emerging performative activity to draw interest to exhibits with content that is challenging to
12
13 make appealing to visitors. A line of further enquiry might delve into the role of content in
14
15 engendering performative activity. Here, we suggest that such activity does not occur at all
16
17 exhibits but only those that have certain characteristics, and are deployed in an environment
18
19 that is beneficial to the emergence of performances. As such, this research provides guidance
20
21 on how to design environments and opportunities for performances to emerge.
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27 Firstly, whilst designers are often concerned with creating interfaces that facilitate
28
29 simple and intuitive use, such designs may constrain possibilities for social interaction and
30
31 co-participation. The analysis presented here points towards the need for interfaces that take
32
33 into consideration the complex and contingent nature of social situations arising in museums
34
35 (see also Borun et al., 1998). Large interfaces and displays provide opportunities for more
36
37 than one visitor not only to see the actions of the user but also their interactive relationship to
38
39 the unfolding events on the screen. Here, we do not intend to contradict the work of Allen
40
41 and Gutwill (2004) which suggests that designing exhibits to support multiple simultaneous
42
43 primary users can be detrimental to visitor experience. Rather we suggest that exhibits should
44
45 engender various levels of participation to support the emergence of an audience and open up
46
47 possibilities for shared experiences.
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53 Secondly, the space around exhibits bears greatly upon the likelihood that an audience
54
55 might emerge around a performance. Designers might consider visitors' sight-lines in order
56
57 to accommodate for the viewing of both the exhibit and its user(s). Visitors appreciate
58
59 standing at or behind walls, or similar physical boundaries to separate themselves from the
60

1
2
3 activity. Providing such partitions allows individuals to participate in the performance from a
4 distance and to slip off silently when their interest wanes. In addition, it appears to be useful
5
6 to design spatial boundaries that have variable properties (Koleva, Schnädelbach, Benford, &
7
8 Greenhalgh, 2000) – for example, those that act both to divide spaces and provide areas for
9
10 viewing.
11
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13
14
15 And finally, the content and structure of the exhibit are important resources to enable
16
17 participants to create a performance in which multiple parties can participate. For example,
18
19 we saw in the analysis how Carol designed her performance at *Energy Everywhere* by
20
21 drawing upon the exhibit narrative. Her desire to wear nothing emerged from the context and
22
23 structure of the exhibit itself. Other exhibits might be designed to pose questions to visitors
24
25 that might structure their physical activity in visually appealing ways. Thus, we suggest that
26
27 visitors be provided with resources to create and shape each other's experience.
28
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31
32 Apart from these implications for the design of exhibits our observations also have a
33
34 bearing on recent debates about social learning in museums. By focusing on performances as
35
36 a particular kind of communication, this paper wishes to extend the current focus on
37
38 conversation to include looking more broadly at the creation of shared experience. With such
39
40 experiences come notions of mediation for learning – how objects and visitors assist others in
41
42 understanding how to engage with both the function and content of an exhibit. Research in
43
44 museums is beginning to shed light on the ways this might occur, for example in using video
45
46 of visitor behaviour at an exhibit to prompt further inquiry at the exhibit itself (Stevens &
47
48 Hall, 1997). In this paper, we suggest that the visitors' activity itself, and in particular
49
50 performance, might be another tool for such mediation.
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54
55 From the outset we postulated that performance might be one way whereby designers
56
57 build on individuals' curiosity to create at least an initial engagement with an exhibit. That is,
58
59 even at exhibits which offer controls for only one or two people – e.g. at *Making Energy*
60

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2
3 *Useful*_where four sets of footpads allow for parallel rather than collaborative or cooperative
4
5 use – there are ways exhibits can be designed to allow participants to create an experience
6
7 that can be, and is, shared by many others. The examples provided in this paper, have enabled
8
9 us to show that performance does more than just create the initial engagement – rather, it is a
10
11 public display of activity – one that establishes and allows individuals to communicate
12
13 exhibit function and usage (knowingly or unknowingly) with others and to create shared
14
15 experiences around the exhibit at hand. As the research presented in this paper suggests,
16
17 conversation is but one form of meaningful participation at an exhibit. Shared experiences –
18
19 including those created through performance – are another. We conclude, then, with a
20
21 question for both the researcher and practitioner communities. Is there a conflict between
22
23 always wanting visitors to be both deeply engaged at an exhibit and actively conversing with
24
25 one another? Or, might it be that shared experiences, including but not limited to
26
27 conversations, allow visitors to create a memorable experience upon which to build both in
28
29 the moment at hand and in the future?
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10 Notes on Contributors

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12 To come
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Footnotes

¹ Notes on Transcription:

- Each bar in the timeline represents one second.
- The beginning and ending times are marked on either end of the timeline.
- One participant's activity is marked on each side of the line (above or below). The name of the participant represented is labelled in each section.
- When used in the transcript, a participant's name is abbreviated by their first initial.
- When there is a change in action, the individual activities - including talk, gesture and gaze - are marked by arrows.
- Gaze is indicated in italics.
- When present, talk is indicated in the space between the timeline bars. The location of the talk along the timeline represents the beginning of the utterance.
- When present, exhibit screen text is indicated between the lines in capital letter. The location of the talk along the timeline represents the appearance of the text on-screen.

² Notes on Transcription:

- The beginning times are noted for each action.
- Bold text represents participant's talk.
- Italic text represents relevant participant movement.
- Capital letters represent exhibit screen text.

Figure Captions

Figure 1. Screen shot from *Making Energy Useful*

Figure 2. Mark interacting with *Making Energy Useful*

Figure 3. *Do Not Touch*

Figure 4. Transcript 1 – Vivian and Carol’s activity at *Do Not Touch*¹

Figure 5. Vivian and Carol’s activity at *Do Not Touch*

Figure 6. Screen shot from *Energy Everywhere*

Figure 7. James and the children at *Energy Everywhere*

Figure 8. Transcript 2 – James and the children’s activity at *Energy Everywhere*

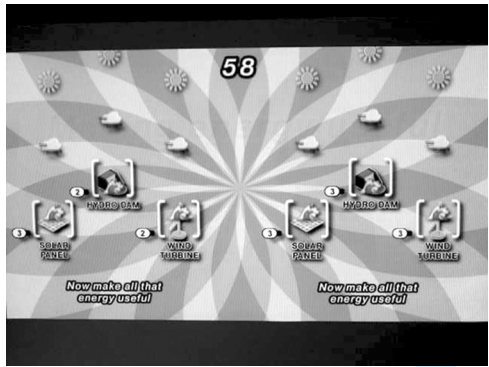
Figure 9. Carol and the children at *Energy Everywhere*

Figure 10. Transcript 3 – Carol and the children at *Energy Everywhere*, part 1²

Figure 11. Transcript 4 – Carol and the children at *Energy Everywhere*, part 2

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Figure 1



Peer Review Only

Figure 2



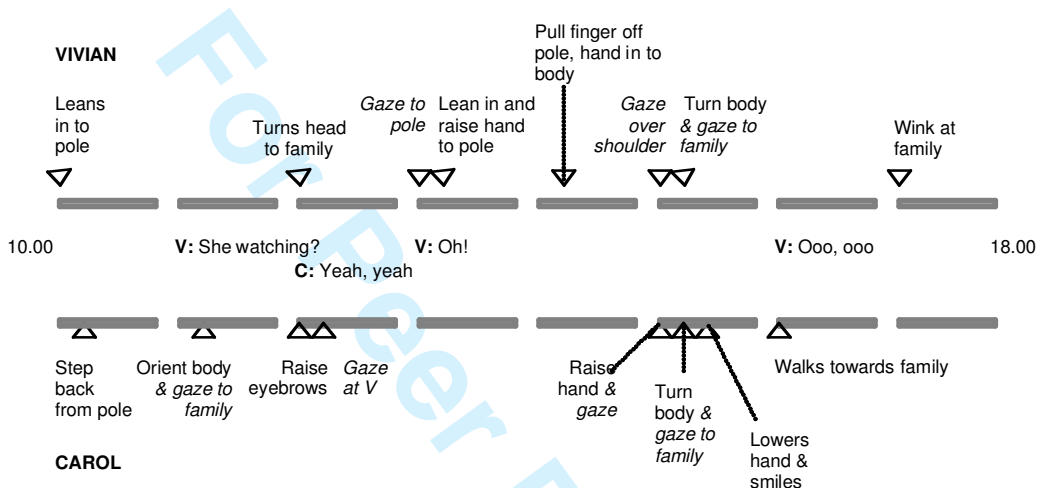
Peer Review Only

Figure 3



Peer Review Only

Figure 4



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Figure 5



1: Vivian raising finger after 'shock'



2: Vivian saying, 'ooo ooo', Carol laughing



3: Vivian winking at family

Figure 6



Peer Review Only

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Figure 7



1: from l to r: Nicholas, Patrick, Christina – mom against wall

2: James appears around screen, children clapping

3: James glances at children

4: James glances at screen

Figure 8

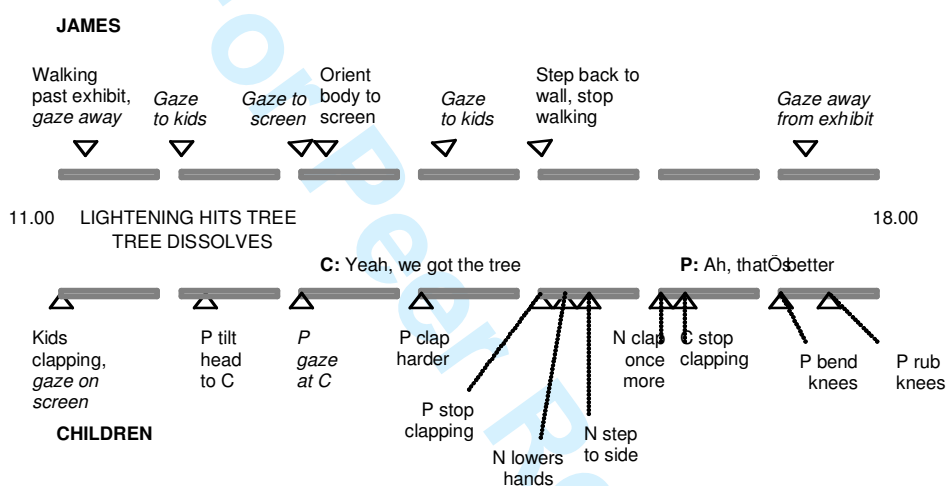
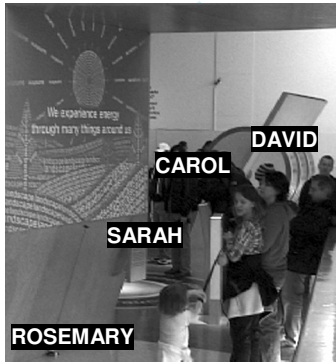


Figure 9



1: Sarah struggles to leave the exhibit



2: Sarah watches the on-screen activity



3: Carol pretends to take off jeans to cool off

Peer Review Only

Figure 10

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- 41.07 C Ah – it’s the sun shining on us – can you feel it?**
42.07 S returns head to facing screen
42.12 R turns gaze towards screen
43.17 R leans further forward and begins to twist under S’s arm
- 44.01 S Ah I’m so warm**
44.14 D turns gaze towards C
- 44.20 C Ah I’m so hot I need to put my knickers on and nothing else**
46.15 SUN MOVES TO CORNER OF SCREEN
48.13 C begins to lean to the side
- 49.03 S Eww say eww**
49.14 R leans back onto S’s legs, C glances down at R
50.05 S shakes R’s arms using her own
- 51.07 R Eww**

Figure 11

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- 51.08 C Oh well – right – that’s it – I’m gonna strip cause I’m so warm**
- 52.06 *C begins to step forward*
- 52.18 *C places hands on hips, steps forward, orients gaze to R*
- 52.22 TREE APPEARS WITH SUN
- 53.11 S Eww**
- 53.16 *M steps out in view of girls, moves hands to button fly*
- 54.10 *R raises hands above her head, S orients gaze to R*
- 54.13 *C pretends to undo her button*
- 54.16 *S shakes R’s arms*
- 55.01 *C lowers hands, steps back into previous place and returns gaze to screen*
- 56.28 R Eww**
- 57.02 *C steps further behind original position*
- 57.21 S Yucky**
- 57.21 *D returns gaze to screen*
- 57.24 *R begins to wiggle in front of S*
- 58.01 C Oh look it’s making the tree all warm – ahh**
- 59.03 *M raises right arm out straight*
- 1:00.04 *M moves outstretched arm in circle, D gaze on M*
- 1:01.07 S Mummy’s gonna get to warm it looks like we may have ta, might have ta**
- 1:01.07 *S orients gaze to R*
- 1:02.08 *C turns head to look at D*
- 1:03.11 D What is this?**
- 1:03.24 *S pull R up to standing*
- 1:05.00 *C turns too leave, D stands up from leaning on wall*