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ACCESS IN HAND: PROVIDING DEAF AND HARD-OF-HEARING VISITORS WITH ON-DEMAND, INDEPENDENT ACCESS TO MUSEUM INFORMATION AND INTERPRETATION THROUGH HANDHELD COMPUTERS

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**With contributions from Gillian Wilson
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based in part on an evaluation by
the Susie Fisher Group for Tate Modern**

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Abstract (EN)

This paper discusses the use of handheld computers or PDAs to provide accessible interpretation for deaf and hard-of-hearing visitors to museums and visitor attractions. It describes digital sign language and subtitled guides at three museums in the US and UK, and shows how content and technical infrastructure from existing digital programmes can be repurposed in Sign Language and Subtitled Guides. The written paper focuses on visitor response to the first British Sign Language Multimedia Tour at Tate Modern in London, while the oral presentation at the ICHIM 2004 conference will also include feedback on a more recent American Sign Language Guide at The Great Blacks in Wax Museum in Baltimore and a Subtitled Guide at the International Spy Museum in Washington, D.C.

Keywords: Access, deaf, hard-of-hearing, hearing impaired, sign language, subtitling, captioning, PDA, handheld computer, multimedia, wireless

Zusammenfassung (DE)

Dieser Beitrag behandelt den Einsatz von tragbaren Computern oder Personal Digital Assistants (PDAs) für gehörlose und gehörbeeinträchtigte Besucher von Museen und Besucherattraktionen. Darüber hinaus wird der Einsatz von digitaler Zeichensprache und untertitelten Führern an drei Museen in den USA und Großbritannien beschrieben und es wird gezeigt, wie der Inhalt und die technische Infrastruktur von bestehenden digitalen Programmen für diesen Zweck übernommen werden können. Im Artikel konzentrieren wir uns auf Besucherreaktionen zu der ersten britischen Multimedia Tour in Zeichensprache in der Tate Modern in London, während wir im Vortrag zusätzlich auf einen aktuelleren amerikanischen Führer in Zeichensprache (American Sign Language Guide) im Great Blacks in Wax Museum in Baltimore und einen untertitelten Führer (Subtitled Guide) im International Spy Museum in Washington D.C. eingehen werden.

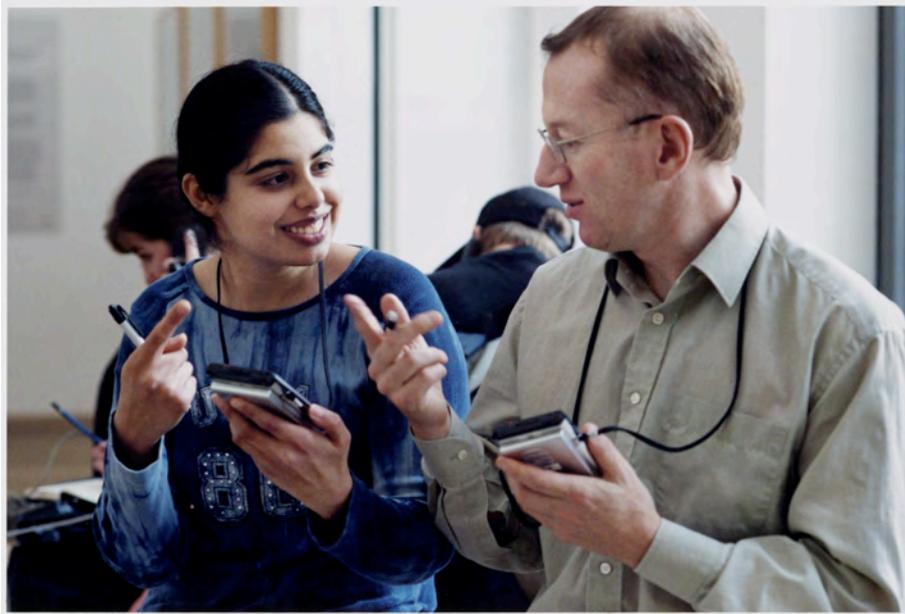
Schlüsselwörter: Zugang, taub, gehörbeeinträchtigt, hörgeschädigt, Zeichensprache, Untertitel, Bildunterschrift, PDA, tragbarer Computer, Minicomputer, Multimedia, wireless.

Résumé (FR)

Cette communication traite de l'utilisation des ordinateurs portables, ou PDAs (Assistants

Numériques Personnels), pour offrir des interprétations adaptées aux visiteurs sourds et malentendants des musées. Nous décrivons les guides utilisant le langage des signes ou le sous-titrage utilisés dans trois musées aux États-Unis et au Royaume-Uni, et nous montrons comment le contenu et l'infrastructure technique des programmes numériques existants peuvent être adaptés. L'article accorde une importance particulière aux premières réactions des utilisateurs du programme multimédia en langage des signes britannique à la *Tate Modern* de Londres. L'exposé oral à ICHIM 04 Berlin fera état d'appréciations toutes récentes des guides en langage des signes américains pour *The Great Blacks* au Wax Museum de Baltimore, et des guides sous-titrés à l'International Spy Museum de Washington, D.C.

Mots-clés : Accès, Sourd, Malentendant, Problèmes auditifs, Langage des signes, Sous-titrage, PDA, Ordinateur portable, Multimédia, Sans fil



Two Deaf visitors to Tate Modern use the British Sign Language Guide

I. New Technologies for Access

For many deaf and hard-of-hearing visitors, new handheld technologies offer the first chance to tour museums in complete independence, receiving interpretation about the displays in sign language and/or ‘closed captioning’ subtitles on a handheld computer or PDA. Through the Sign Language Guide, deaf visitors can watch video footage of signed interpretation on a screen-based device that fits in the palm of the hand. The video and multimedia content can also include subtitles. Often the same handheld computers, wireless infrastructure, and even content deployed for multimedia tours can be re-utilized in Sign Language and Subtitled Tours for deaf and hearing-impaired visitors.

Sign Language and Subtitled Guides increase access not only to the museum, but also to the fields of study addressed in the museum: by seeing subtitles and/or signs for art and other specialist terms with which they may not be familiar, for example, visitors both learn about the objects on display, and also learn the signs and words necessary to enable them to participate more fully and delve more deeply in these topics.

The Sign Language Guide

The Deaf community is a cultural and linguistic minority, which includes people who were born deaf, were deafened before beginning to speak, or who may have deaf parents and whose first language is Sign Language. People who identify themselves in this way

do not consider themselves to be disabled, but as members of a specific community, describing themselves as Deaf with a capital D.

The use of museums, libraries and archives has often figured low in the cultural experiences of those whose first language is one of the world's many sign languages, as written text represents a second or 'foreign' language and therefore a less accessible or direct route to information. Often there is very little provision of information and interpretation in sign language at museums, and deaf visitors requiring sign language interpretation are usually required to book in advance or attend talks as a group.

With the introduction of more powerful PDAs, it has become possible to use the handheld platform to deliver video-based tours to deaf and hard-of-hearing visitors to the gallery. Content can be locally-stored on the PDA or accessed on the hand-held computers through a wireless network that connects to a central server. In a wireless network, practically limitless information and content with real-time interactivity can be delivered to visitors in the gallery, including video and still images that provide additional context for the art and other interactive features. For the first time, museums and galleries can offer personal Sign Language Guides to allow deaf visitors to be independent and enjoy on-demand access to the gallery in the same way as the majority of visitors.

Crucially, the Sign Language Guide is not a simple translation of a tour into a sign language. Unlike more traditional signed interpretations of television broadcasts or presentations, the Sign Language Guide must not only communicate information about the displays, it must also help engage deaf visitors with the exhibits – teaching, entertaining and inspiring them. The deaf visitor, like any visitor, has after all come to the museum or gallery to see its collections and exhibitions, not to watch signed television on a very small screen! Interpretation on the PDA is interpretation in both senses: it communicates in the Deaf visitor's preferred language, but it also goes beyond simple facts and information to *interpret* the objects on display, drawing the visitor into a three-way dialogue among the exhibit, the tour message about the exhibit, and his or her personal reaction to both.

The 'voice' of the interpreter is key to this conversation among exhibit, interpretation and the visitor. Although the Sign Language Guide must remain faithful to the museum's message and approved script, it also needs to read as the *interpreter's* commentary in order to communicate fluently and effectively to a Deaf audience and not feel like a stilted translation.

The interpreter literally embodies the tour's message and strongly impacts the tour experience. It is therefore imperative to choose the sign language interpreter(s) carefully, looking for an ideal match between the interpreter's skills and interests and the message of the museum or gallery producing the tour. (The choice of interpreters for the sign language guides at Tate Modern and the Great Blacks in Wax Museum is discussed in the sections dedicated to each of these projects below. Issues in repurposing scripts for Sign Language Guides are elaborated in the 'Repurposing Technology and Content' section below.)

The negotiation of these three elements – the exhibit, the interpretation, and the visitor – requires a careful structuring of content in the Sign Language Guide. Generally speaking, the Sign Language Guide should never stand on its own: it should always bring the visitor back to the exhibit, never being complete without that direct experience of the object(s) in space. This aim governs the ordering of information in the tour, including the interspersing of signed interpretation with other multimedia content and interactive elements. Just as importantly it informs the inclusion of pauses in the tour content and moments in which the visitor interacts with the displays. To the extent it is possible, the pacing of the signed tour should be roughly equivalent to that of a spoken tour. As with any tour, the visitor requires time to look and think, and the ability to pause, rewind, replay and fast forward content in order to remain in control over his or her experience. An effective Sign Language Guide, taking all of these points into account, is a multifaceted tool that will help each deaf visitor find a unique way of engaging with the museum or gallery.

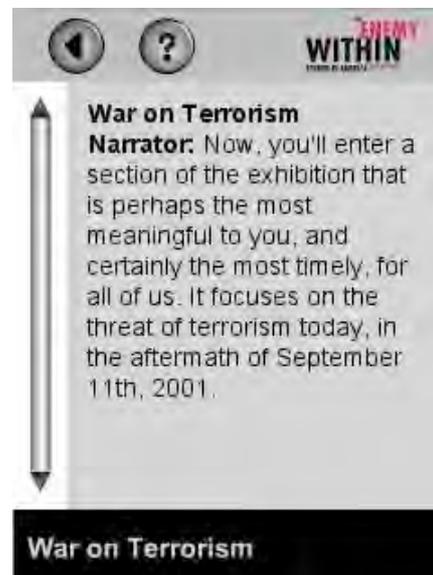
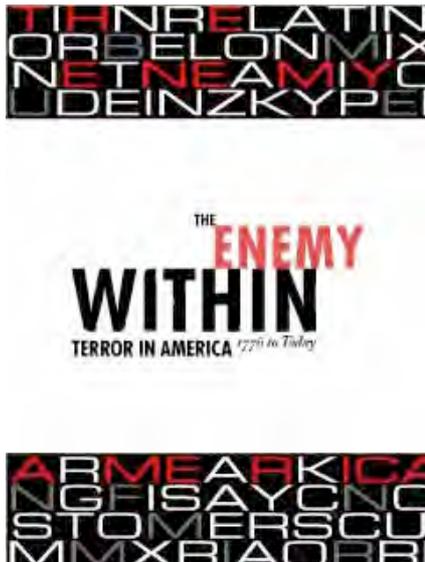
Subtitling and Concept Captioning

Sign Language Guides can include either 'concept captioning' for key words and phrases or subtitling, or both. Concept captions provide text equivalents of key words or phrases from the signed content. Concept captioning can be used to reinforce visitors' understanding of words, phrases or ideas that may be unfamiliar, showing the text for a sign at the same time as that sign is made in the video footage on the PDA. Captioning is also useful to show visitors the correct spelling of someone's name, or underscore a key date or other figure where these items may be finger-spelled by the interpreter in the video footage and therefore be harder to catch on the PDA's small screen. Captioned signs can be referenced in a sign language glossary as part of the tour to provide additional support to visitors' grasp of the language and information in the tour.

Subtitles can also be used in sign language guides as well as other multimedia tours to provide a full text translation of the signed interpretation or other video or audio content. This text-based version of the tour can be more accessible for visitors who are hard-of-hearing or adult deafened, and who do not rely exclusively or primarily on sign language.

In the past, visitors with hearing difficulties who prefer text have often used printed copies of the audio tour script or other written materials as their primary interpretation in the museum. The subtitled guide provides access to the same materials but in a smaller, more portable and backlit format, and like the sign language guide, can include interactive features and activities from the multimedia tour or other digital resources. Where a subtitled guide is part of a larger digital tour programme, its main attraction to many hard-of-hearing visitors can be that it plays on the same device as the other multimedia tours; visitors with hearing impairments do not stand out by carrying a script instead of a PDA, and can feel more part of the larger gallery community by sharing a similar experience with others.

The International Spy Museum in Washington, D.C. offers a highly interactive, multimedia experience. Numerous computer stations, video monitors and hands-on exhibits encourage visitors to test their skills in the world of espionage through disguise, surveillance and threat analysis. A subtitled guide to the exhibits used in this extremely popular attraction allows visitors with hearing difficulties to get the full story on spies from around the globe through a high-tech handheld computer – their own personal spy device! The PDA plays three videos in full with subtitled transcriptions of their soundtracks. Scripts and descriptions for 17 shorter exhibits are also available from a scrollable menu on the PDA's screen.



Screen grabs from the International Spy Museum's Subtitled Guide to "The Enemy Within: Terror in America". Left to right, top to bottom: Welcome screen; Main menu; Subtitled clip from "The Commies Are Coming" video; Script from "War on Terrorism" exhibit.

Tate Modern's British Sign Language Multimedia Tour

The world's first wireless sign language guide was piloted at Tate Modern in October 2003 as part of a three-tour programme, also including an audio-visual Multimedia Highlights Tour for young people aged 16-25 and a text-based Collections Guide that consisted of a searchable database of catalogue essays and labels on works in the permanent collection displays. All three tours were sponsored by Bloomberg and provided in the galleries on PDAs loaned by Toshiba.



Tate Modern's British Sign Language Multimedia Guide, interpreted by curator Claire Morgan, includes both concept captions and full subtitles. The interface can be navigated with a finger or a stylus.

Tate Modern has always aimed to work at the cutting edge of educational technology. Audio guides have been part of the interpretation and education strategy since Tate Modern opened in May 2000, winning awards for its tours for children and for the visually impaired. Over the past two years, with sponsorship from Bloomberg, Tate Modern has also worked with Antenna Audio to develop a system of gallery interpretation that connects handheld computers or PDAs to a wireless network and provides multimedia information, communication and access to database-stored texts. In 2002, Tate Modern's Multimedia Tour Programme received the British Academy for Film and Television Arts (BAFTA) Award for Technical Innovation, while in 2003 it was awarded the Museum and Heritage award for Best New Product or Service.

British Sign Language (BSL) is the preferred language of 50,000-70,000 people in the UK, and is more widely used than Welsh or Gaelic. The British Government recognised BSL as an official language in 2003, and it is recognised by the Greater London Authority as a minority language. Tate Modern's BSL Multimedia Tour was an opportunity for deaf and hard-of-hearing people to visit the gallery and gain independent access to information in their first or preferred language - BSL.

In addition to multimedia and interactive content about the artworks, the BSL Tour featured video footage of Claire Morgan, the Curator of Special Projects at Tate Modern, discussing

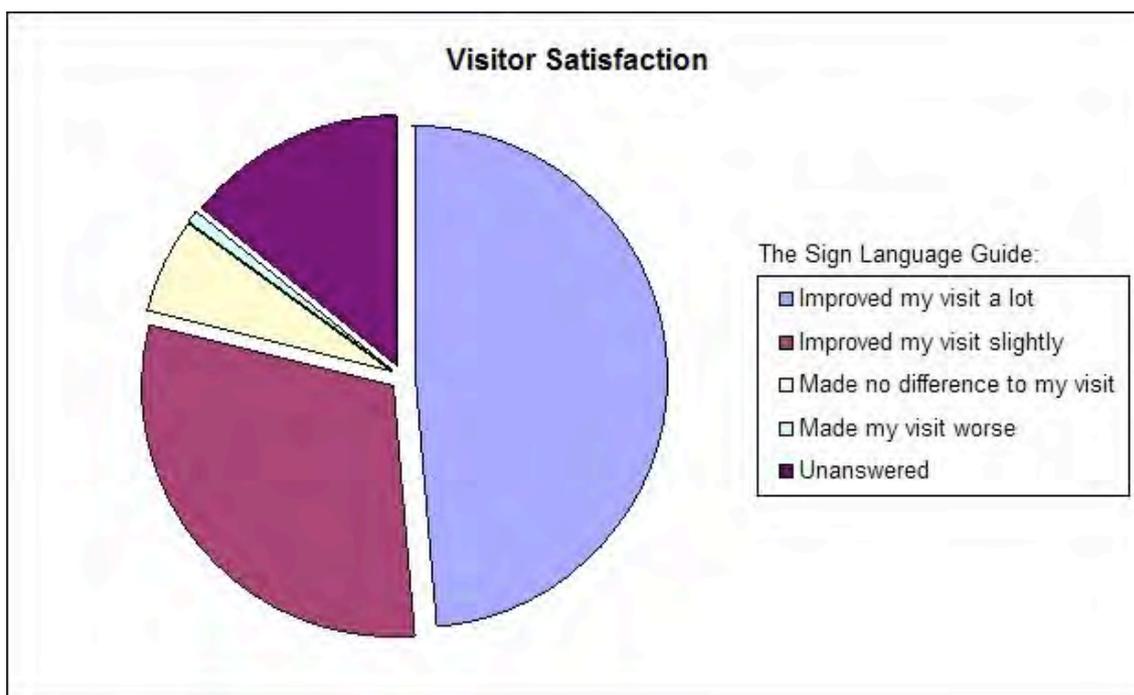
works on display in British Sign Language. The artists' quotations used in the tour were translated into BSL and signed by contemporary deaf artists. The tour also included signed responses to artworks by deaf visitors. Optional subtitling and captioning gave an additional means whereby visitors could access information in English text, while a video Glossary of art terms provided a sign language definition of any unfamiliar art terms that the visitor encountered in the interpretative content. The BSL tour included many of the interactive and multimedia features developed for the Multimedia Highlights Tour, such as games and instant messaging. Visitors taking either tour could send each other text messages in the gallery, and request further information about the art they had seen to be sent to their home email address. These features encourage both a sense of community and exchange of ideas among visitors in the gallery, and a continuation of the in-gallery experience after the visitor has left from home or school via Tate's website.

Quantitative Evaluation

In order to inform the further development of both the audio-visual and the BSL tours at Tate Modern, all users of the Multimedia Tours were asked to complete a questionnaire evaluating their experience. 130 BSL users responded to the survey regarding the BSL Multimedia Tour.

84% of the BSL tour users were from the UK. Of these, the majority were over 21 (20% were 21-25; 39% were 26-40; 18% were 41-60), in contrast to the Multimedia Highlights Tour, which was specifically designed for younger visitors, aged 16-25. Only 18% of the BSL Multimedia Tour users were under 21 years of age, and 3% were over 60. The BSL tour users ranked themselves as very comfortable with technology, with 62% considering themselves above average in computer literacy.

Although there were half the artworks on the BSL tour, deaf visitors stayed longer than those taking the audio-based Multimedia Highlights tour: their average visit was 77 minutes with a maximum of 240 minutes, in comparison to an average of 70 minutes for hearing visitors. This lengthier visit of fewer displays may be in some part a result of the visual structure of a sign language guide, which requires visitors to look at the displays and at the interpretation on the screen as two temporally separate actions, in contrast to an audio-based guide where the visitor can simultaneously look at an exhibit and hear interpretation about it.



Regardless, BSL tour users reported a very high satisfaction level: 79% reported that the tour had improved their visit; 6% indicated no change; 1% reported that the tour had made the visit worse; and 14% did not respond to this question.

The Sign Language Guide was also credited with the ability to bring deaf visitors back: 84% of visitors who come once or twice a month would come more often if there were a permanent Sign Language Guide, while 78% of those visiting once or twice a year and 74% of first-time visitors would return more often.



Qualitative Analysis

All visitors who completed questionnaires on the BSL tour were encouraged to leave their comments in order to provide more qualitative feedback on the tour. In addition, Tate commissioned an independent evaluator, Susie Fisher, to carry out research on the Multimedia Highlights Tour for hearing visitors and the BSL Multimedia Tour during December 2003. Fisher's evaluation consisted of three focus groups, one of which looked exclusively at the BSL tour, and three accompanied gallery visits where visitors using a PDA were accompanied through the gallery as they used the Multimedia Highlights Tour. A mixture of users and 'non-users' were included in the sample (the non-users were asked to try out the tour but wouldn't have chosen to take it otherwise).

The BSL focus group consisted of one, two-hour discussion with Claire Morgan of Tate Modern as interpreter. The deaf participants included 2 women and 1 man, aged 16-25. All were higher education Arts students who had previously used the Tour – young, stylish, and in love with art.

"I saw the Jackson Pollock and looked at it all the way through."

The BSL Tour is uniquely valuable to deaf visitors, so generally speaking, deaf visitors have been deeply grateful for any material designed for the deaf and reluctant to criticise the BSL Tour.

“We’re lucky to have Art where you can press a button.”

“Having access for deaf people means a lot less doubt. It’s very unusual. It’s nice to have more information.”

At the same time, these visitors are ready to debate and looking for challenging discussions about Art.

“They should have Art experts and non experts. People signing to say what they thought. Here’s the debate and compare to the different backgrounds.”

The goals of the focus group were:

- To identify how the Multimedia Tour works within a gallery visit
 - Groups/individuals*
 - Navigation*
- To assess the ease of use of the equipment and programme design
 - Interface*
 - Menu options*
- To observe how the menu of options is used in practice
 - Triggers to try options*
 - Experimental or personal usage profile*
 - Likes and dislikes*
- To understand how content options are perceived at each stop
 - Intellectual level*
 - Serious or entertaining*
 - Interactive or information-giving*
- To understand how the Multimedia Tour impacts the visitor’s engagement with the works

Depth, learning

Stimulation

- To explore future directions for the PDA

Gaming

Downloading

Personalised content

Database access

The BSL Tour includes similar content to the Highlights Tour, and several functions are common to both tours, such as the ‘Tate Txt’ messaging system, interactive map of the galleries, games and visitor polling. Nonetheless, the script for the sign language version of the tour had to be completely rewritten to work when signed in BSL, which has a different conceptual and linguistic structure than English. The final BSL script was written in English but in such a way that a signer could easily translate phrases and meanings into BSL while being videoed.

Deaf visitors responded very similarly to hearing visitors on most of the key content issues, and confirmed that much of the material from the audio-visual Multimedia Tour can be transferred with signed translation to the BSL tour.

Like hearing visitors, BSL users did find that the tour gave them information at the right level:

“It’s high enough, easy to understand.”

They enjoyed getting involved in the gallery community of hearing and deaf visitors through the tour’s opinion poll:

“I loved to see the results. It’s a really nice idea, the graphics bar chart. It’s changing opinion. It’s really interesting.”

“You see hearing people with audio guides and you think ‘Why haven’t I got one’? I’m equal.”

They wanted to hear from the artists themselves:

“More about the Artist themselves, Mark Rothko talking about a picture.”

And they appreciated the use of videos of artists:

“The video really helped us understand what the artist does.”

They found it hard to orientate in the gallery because of the size of numbers for tour stops on the wall labels and lack of correspondence between room names on the tour map and in the galleries:

“It took a long time, difficult to follow.”

On the other hand, some issues were more salient for deaf people than hearing visitors. It is genuinely empowering for deaf people to have a BSL tour; it leads them into greater fluency and learning about arts concepts. Conscious of having to work hard to achieve the level of information which is readily available to hearing people, deaf users were particularly grateful for the Glossary function:

“The glossary is so useful. They are new words. What does that mean?”

Participants in the focus group commented that deaf people are not often enough exposed to academic subjects, such as the interpretation of contemporary art, in BSL. They may therefore not be fluent in those concepts, either in written English or BSL.

“It’s good for deaf people to learn new things and useful for deaf people to improve their language skills. For example, the word ‘Impressionists’ teaches us how to use that sign.”

English subtitling therefore provides a bridge between the concept, the sign language, and the wider art discourse that is carried on in English. Each linked element – Signing, Glossary, and Subtitle – bolsters the user’s understanding of the others and increases their fluency and capacity.

“The English is at a higher level. With subtitles you read the English as well. Grab both.”

“New art words, a signed dictionary to say what they are.”

“It’s giving you the tools, you can understand the basic concepts.”

“I like to use the glossary. It’s more an explanation of the arts. The visual BSL gives you confidence. It’s a starting point.”

As deaf people and students of Art, some deaf visitors were particularly concerned about getting the most educationally out of the tour experience; they wanted more information and less play:

“I didn’t use the game. I want serious info and the opportunity to hear about Art.”

But others were equally passionate about their subject and ready to debate this point.

“Playing games helps you understand things, because artists themselves play games.”

Susie Fisher concluded that in this initial, interpretation-hungry period of the introduction of the BSL tour, deaf people may need a more straightforward presentation of serious art content that is more information-based.

The narrator of the BSL Tour is a Tate Modern curator who is a hearing person who uses BSL fluently. Several deaf people questioned this choice of narrator, feeling that it would be more appropriate to employ a deaf person for this task. Others felt that the tour and the need for BSL interpretation in the gallery generally gained legitimacy from being interpreted by a Tate curator who is fluent in BSL.

The BSL tour users were also very sensitive to fluctuations in speed and rhythm in content delivery and playing. The BSL Tour relies on video much more heavily than the Highlights Tour so any slowness in playing the content is a real irritation; for example, slower PDA processor speeds or network connectivity problems can slow down the signing on screen, creating comprehension difficulties for the BSL user – rather like listening to an artificially-slowed audio track for a hearing person.

“It’s really frustrating pausing and having to wait. Very frustrating. I don’t know how to resolve it and go on to the next.”

Nonetheless, deaf people were overwhelmingly positive about the provision of such tours in galleries and were delighted to see interpretation in their first language rather than having to rely on interpretation in English or wait for a monthly BSL-interpreted gallery tour. The focus group evaluation demonstrated that this audience will make serious and thorough use of a BSL tour and will be thrilled to have the opportunity to take a BSL Tour whenever they want to visit.

“It’s great to have a BSL Tour Model. I would come here in my own time and study all around the gallery. Thank you.”

“Now that I have the information, I look at the art with greater understanding. Before it was la la la in my brain. I feel closer now.”

At last it has become possible for deaf visitors to enjoy the same high quality, on-demand interpretative content that hearing visitors have come to expect from Tate Modern’s audio and audio-visual tours.

The American Sign Language Guide at the Great Blacks in Wax Museum

The Great Blacks In Wax Museum, a private non-profit cultural and educational institution in Baltimore, Maryland, was founded in 1983 by Drs. Elmer and Joanne Martin. Featuring over 100 wax figures, the museum details the African American experience from ancient Africa and slavery, through the civil rights era, and up to today. Because it is a wax museum committed solely to the study and preservation of African American history, it is among the United States’ most dynamic cultural and educational institutions, continually updated as African American history and its interpretation develop over time.

A primary motivation for establishing the Great Blacks In Wax Museum was to “use education, history, and example to help mainly culturally disadvantaged youth overcome feelings of alienation, defeatism, and despair.” As a result of their exposure to the Museum and its programmes, these young people, as well as many adults, learn more about their heritage and have a greater understanding of significant contributions to civilization by people of African descent.

Intellectual access is a top priority for the Great Blacks in Wax Museum. In order to better reach visitors whose first or preferred language is American Sign Language (ASL), The Great

Blacks in Wax Museum collaborated with Antenna Audio to create an ASL tour based on the *Voices of History* audio tour of the museum. The Sign Language Guide at The Great Blacks in Wax Museum is the first digital American Sign Language tour to be offered in a US museum. A tour for visually-impaired visitors, which provides enhanced visual descriptions of the exhibits, is also available at the museum, alongside a children's and adult's audio tour. All tours are complimentary with admission to the museum.



Nathie Marbury narrates the *Voices of History* American Sign Language Guide to the Great Blacks in Wax Museum in Baltimore, Maryland, which includes optional concept captioning.

The Sign Language Guide is presented in ASL by Nathie Marbury, a well-known Deaf story-teller and teacher. Following the *Voices of History* audio tour script, the Sign Language tour discusses many of the significant individuals and events depicted at the Museum. The tour also provides visitors with the option of concept captioning for the signed video footage, depending on their needs and preference, as well as general information about the Museum and a help function.

The decision to engage Nathie Marbury as interpreter was very carefully and deliberately made. Firstly, Marbury's storytelling skills were ideally suited to the nature of the 'Voices of History' Tour and indeed the African American tradition of storytelling and oral histories. Secondly, Marbury's first language is ASL, ensuring that the histories represented in the tour are fluently and accurately communicated to the ASL audience. And finally, being a Deaf African American, Marbury was able to embody the voices of the tour more fully, making the commentary more immediate, compelling and personal for the target audience – not just a translation from a script designed for hearing people.

During the design of the American Sign Language Guide, Antenna Audio consulted with members of the Technology Access Program at Gallaudet University in Washington, D.C., the world's **ONLY LIBERAL ARTS UNIVERSITY IN THE WORLD**

DESIGNED EXCLUSIVELY FOR DEAF AND HARD OF HEARING STUDENTS, TO GET INVALUABLE FEEDBACK ON HOW TO MAKE THE GUIDE MOST USEFUL FOR AMERICAN SIGN LANGUAGE USERS.

Cary Barbin, research engineer for the Technology Access Program commented after his visit to Great Blacks in Wax Museum: “For the first time in front of the exhibitions, I was able to see the stories presented in American Sign Language rather than reading off a binder in the dark. This enabled me to follow the story visually. The ASL guide really enriched the whole museum experience.”

II. Repurposing Technology and Content for Increased Access

The production of any digital tour usually requires the commitment of precious resources and funds on the part of the museum or gallery, so it is essential to obtain as many uses out of any new and existing assets as possible. The technical infrastructure of an existing wireless network or multimedia tour system offers the most direct opportunities to get multiple uses out of the same investment. At Tate Modern the wireless network in the galleries served any of three tours to the same stock of PDAs, and can also be used by Tate staff for back-office and administrative purposes.

In many cases, multimedia and interactive resources can also be repurposed from the museum’s other tours and digital publications to help create the sign language or subtitled guide. Conversely, the signed video footage and subtitles can be added to a museum’s website, information kiosks or digital catalogues to expand access to these publications. And this is not just an economic consideration: at Tate Modern the interactive games and instant messaging facilities shared by the BSL and multimedia highlights tours served to bring deaf and hearing audiences together in the galleries, emphasizing common interests and experiences rather than segregating visitors on the basis of ability. Links to Tate Modern’s website, included in emailed ‘bookmarks’ of information that visitors send themselves from the tour, also build the visitor’s relationship with the museum and help extend it into the school or home.

As is the case in any project to repurpose content across platforms and audiences, assets are far more likely to be reusable in the future if they are created with the goal of repurposing in mind from the outset. The audiences and publication platforms that the repurposed assets will be aimed at should be established early on in the content production process. This will help

the script writers and designers consider how best to craft a multimedia message for maximum reuse, and will also flag any copyright problems or additional expenses that could arise when a given asset is published in a new way.

At the Great Blacks in Wax Museum, the script of the *Voices of History* audio tour was used as the basis for the American Sign Language tour script, while Tate Modern's British Sign Language Multimedia Tour is an adaptation of the Multimedia Highlights Tour. Perhaps contrary to expectations, however, it is not enough simply to translate the English script into a sign language in order to produce an accessible tour. We write differently when information has to be delivered orally than when it is to be read off the page. Similarly, an idea may need to be structured or phrased in a particular way in order to be communicated optimally to a sign language user. In addition, as with any translation, there can be profound cultural differences in how an idea is understood or received by Deaf people in comparison to its common usage in the original language. These and the different amounts of time required to convey a given bit of information in sign language in comparison to the original written or spoken language must be taken into account in structuring the sign language script. An expert 'sign master' can help with the translation and provide an approved sign language script to the signer who is actually videoed for the tour.

In particular, the temporal difference between a signed and a spoken statement can be marked. Although each of the world's official sign languages and sign language dialects is unique, they generally differ from written and spoken languages in their three-dimensional and often a-linear nature. Meaning is not created in British Sign Language, for example, as in English, by the linear sequencing of ideas in time or space of the spoken or written statement. Instead, ideas can be elaborated and placed in the three-dimensional space that exists in front of and around the signer. They can be touched upon, literally, and combined in a semiotic structure that is articulated in the physical areas between and among interlocutors.

Nor are the world's many sign languages universally intelligible to all sign language users. French Sign Language is as distinct from German Sign Language as spoken and written French is from German. American Sign Language has more in common with French Sign Language than with British Sign Language. It is therefore necessary to build a distinct tour for each sign language audience addressed in any given museum, just as catalogues, audio tours and wall texts are provided in a variety of written or spoken languages.

Nonetheless, the audio tour script represents a completed body of research and a coherent statement of the museum's key messages about its displays that can be reiterated in the sign language guide. In addition, the written text provides a valuable source for any subtitling or concept captioning that may accompany the signed interpretation.

III. Implementing Access for All

Thanks to these technical advances, museums have ever-increasing means to reach new audiences and better serve all visitors. Good access for any given audience often means better access for all. With nearly universal legislation requiring cultural sites to enable physical and intellectual access, there has never been a better time for museums to test these new solutions and learn how best to integrate each into a complete visitor services and interpretation programme.