



Figure 1: One part of the Whale Hunting Exhibition's room (left), and a mark on the floor indicating an audio local (right).



Figure 2: Children in Group A wearing numbered stickers and using the audio guide device.

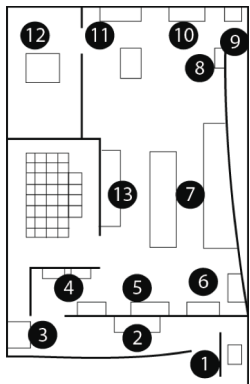


Figure 3: Map of the exhibition and location on the specific artifacts

Audio Guides And Human Tour Guides: Measuring Children's Engagement & Learning At A Museum Setting

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Abstract

In this poster we present a study exploring the benefits of using audio guides instead of human tour guides to foster children's engagement and learning outcomes during their visit to a natural science museum. We conducted an experiment in a museum with 25 children from a school (9-10 years old) in order to discover if there was any effect of the usage of audio guides regarding children's engagement and learning outcomes. We did a pre-test and post-test analysis for learning, applied scales and conducted qualitative observation. We found that children using the audio guide were keen to repeat the tour. We also noticed differences in the learning outcomes (the group without audio guide had better results), although it was not statistically significant. We conclude the poster with a set of suggestions to increase enjoyable learning experiences for children when using audio guides in a museum tour.

Author Keywords

museum, learning, engagement, audio guides, human tour guides, children, enjoyment

MEASUREMENTS

The independent variable was to carry out the museum visit with or without an audio guide. The dependent variables were the engagement with the exhibition and the learning outcomes.

Engagement: To measure engagement we used validated scales from the User Evaluation Toolkit (the *Again-Again Table* to measure **engagement**, and the *Smileyometer* to measure **enjoyment**).

Learning: The learning goal of the tour to the museum was to know about the whale hunting's process through the last years as well as the materials and items which could be derived from the whale hunting. We carried out a general pre-test/post-test assessment of their knowledge before and after the visit, regarding the same issues with the same level of difficulty.

Qualitative data: In the end of each tour, the researcher asked to each group at once if they enjoyed the tour and why in order to have qualitative feedback about the experiment.

ACM Classification Keywords

B.4.1 Data Communications Devices; K.3.1 Computer Uses in Education

Introduction

Museums are slowly but surely moving away from the metaphor of being just collections of artifacts to become centers where people can engage and empower their knowledge by discovering and challenging themselves [3,4]; visitors are turning from passive to active participants [5,9]. Usage of audio guides at the museums dates back to the 1950s [11], allowing museums' audience to indulge in narratives that aid the construction of meaningful memories as well as providing the fulfillment of a complete experience. Although the museums' spatially constructed narrative might be present in a logical and consistent way, not all visitors choose to follow, learn and engage with it [10]. Though, there are absolute cases where the visitor's mental model discords with the design of the exhibition that they are interacting with [6], changing the focus from experience onto the guide's design itself, interrupts the flow [2] which eventually leads to frustration and poor user experiences. Therefore, learners might fail to elaborately appreciate the exhibits due to its abundance of precious information and time constraints which may ultimately lead to information overload [1]; or due to the lack of interest of visitors in the interpretation of the exhibit [8]. Having said that, museum oriented learning is a quintessential research topic in the field of informal learning, and those poor user experiences that could occur during this learning process need to be related, understood and dealt with in order to craft an informal learning environment that

enables children to explore, elaborate and expand their knowledge within the museums.

Experiment location

In order to better understand what is the effect of the usage of audio guides regarding children's engagement and learning outcomes we conducted a study during the Whale Hunting exhibition (Figure 1) at the Whale Museum from Madeira Island which has audio-guided tours to engage their visitors. The audio guide devices were built both for children and adults' usage. The museum uses two different approaches for the audible content, one for adults with an adult narrator voice, and another for children with young voices in a dialogue with each other, prompting the listener to search for items and to take an accurate look at them better and understand several scientific or historical concepts tied to the exhibit. Near each artifact or set of artifacts, there are marks on the floor in order to prompt children to go to the specific location and listen to the podcasts (Figure 1). This is due to the nature of audio guides being activated by sensors. In the adults' version, the user has the choice to type a specific code that is near the art piece to get more detailed information about that particular piece. On the contrary, the children's version remains unresponsive to any manual inputs.

Sample

We focused on 9-10-year-old children taking advantage of the highest children's target groups who visits this particular museum. The sampling method that was chosen is a non-probability based method, mainly a convenience sample. After obtaining consent from one single school we selected 25 children between 9-10 years old of two different classes. The children had

ANALYSIS

This section explains how the statistical analysis was made regarding the chosen measures.

Again-Again Table: it was applied to check if the children were keen to repeat the activity again, reflecting their engagement. In the table users just needed to select one of the following options: Yes, Maybe, No. We computed its frequencies.

Smileyometer: it was prepared to elicit children's opinion/enjoyment on the overall activity. This was only a question where children needed to rate on a 5-point Likert scale how much they enjoyed the event. Each smiley was then scored as 1=awful; 2=not very good; 3=good; 4=really good; 5=brilliant.

Learning: we computed the difference between the first test with the second test to estimate if the learning increased or not concerning the type of tour attended.

never been in the chosen museum before. The users in the same class knew each other; hence to minimize this bias, we randomly picked the students and then categorized them into two groups: one for conducting the visit with the audio guide and a human guide (Group A) and another one to perform the same task only without any digital device (Group B). After all the students have been assigned to a group we went on to issue them with numbered stickers which they stuck on their outfits in order to easily identify their group (Figure 2). Group A contained 13 participants (8 males, 5 females). Group B contained 12 participants (4 males, 8 females). With Group A, the tour lady prompted the users to go to the specific places to hear the narrated audio piece; with Group B, the lady herself narrated specific stories and concepts when near each artifact (Figure 3).

Results

Quantitative results: engagement, learning

On the Again-Again Table [7] the value of the Chi-Square is 8.440. This value was significant ($p < 0.015$). This significant result indicates that there was an engagement associated when going on a visit with the audio guide. Therefore, and for this sample, we can conclude that the type of visit performed significantly influenced the children: they would go to the museum again for the audio guide but not for a visit without this tool. Regarding the Smileyometer [7], although we had higher values on ranks, the Test Statistic showed us that those results were not significant; enjoyment (Smileyometer) in Group A ($MD=5$) did not differ significantly from Group B ($MD=5$), $U=77$, with small effect size ($R=-0.02$). Regarding the Learning, the difference between the knowledge acquired in the Group B after the exhibition without audio guides

($M=15.42$; $SD=28.01$) was greater than those who made the visit with the audio guide ($M=2.23$; $SD=28.28$). This difference was not significant $T_{(N-1)}=t$, $p > 0.05$, with a small effect size of 0.24. Regarding this sample, we can infer that a visit without the audio guide can increment the learning same as a visit with an audio guide does. Although these preliminary results go in this direction, further studies with a larger sample are needed in order to clarify these results.

Qualitative results: verbal appreciation

Group A generally enjoyed the tour with the device telling that it was a fun way to make the museum tour. Nevertheless, some of the children told that the audio guide had too long podcasts. The general verbal appreciation was at follows: "I loved it!"; "It's funny!"; "It speaks a lot!!"; "At the beginning I thought that the tool was a cell phone for us to talk to each other...". This last comment was due to the physical aspect of the audio guide device (Figure 2). Regarding Group B, at the end of the tour, this group was prompt with the possibility of having had done the visit with an audio guide. Hence, they were asked about their preference for doing the visit with or without the audio guide. They enjoyed the visit without audio guides in general, although most of the group would like to try the visit with the audio guide. However, they liked the tour lady explaining and the fact that they could talk with their friends while performing the tour. The general verbal appreciation was at follows: "I did like this visit not being with audio guide; otherwise, I could not talk with my friends"; "I would rather do a visit with an audio guide rather this one because the audio guide is new stuff!"; "I would like to try with the audio guide"; "I liked this visit with the lady explaining".

Summary of statistical tests applied

Again-Again Table			
	Group A	Group B	Sig. (2-tailed value)
Yes	84.6%	33.3%	Chi-square p: 0.015
Maybe	15.4%	25%	
No	0%	41.7%	

Smileyometer		
Group A	Group B	Sig. (2-tailed value)
MD=5 IQR=0	MD=5 IQR=0	Mann-Whitney p: 0.932

Learning		
Group A	Group B	Sig. (2-tailed value)
M= 2.23 SD= 28.28	M= 15.42 SD= 28.01	Unrelated t-test p: 0.254

Contribution

In order to explore the benefits of using audio guides instead of human tour guides to foster children’s engagement and learning outcomes during their visit to a natural science museum, we argue merging the use of audio guides along with human tour guides would be a better solution for providing more enjoyable learning experiences. We propose to enhance the usability of the audio guides while adopting the benefits of human tour guides. Thus, allowing museums’ curators to improve the flow of the experience as well as possible consequent learning. We recommend the following improvements for an audio guide tour aimed at children:

- *Device*: the physical device for audio guides (at least without touchpad as the one of the Whale Museum) should be built for children’s usage and not for both adults and children. We noticed significant constraints feedback when inserting the numbers through the keyboard.

- *Sensors*: the usage of sensors should not interrupt the flow of the experience. Children noticed that the podcasts were always being repeated if they remained at the same place. An improvement could be to utilize the device’s keyboard to dial the exhibits’ number to prompt the children with the audible content; this avoids the repetition of content while providing the ability replay a content at the child’s will.

- *Content*: the content of the podcasts should prompt the children to request additional information about the exhibits from the human tour guide.

- *Human Tour Guide*: the human tour guide should tailor their tour by incorporating audio guides. We recommend having the human guide to capture the attention of the children and allow them to listen to the podcasts at the same time. The human tour guide should direct the children to appropriate artifacts that are significant for the children and ask them to insert a specific code corresponding to the exhibit on the audio guide device. After everyone has gone through the audible content, the human tour guide should sum up the information and invite the children to share what they think of the exhibit in order to promote reasoning, discussion, and socialization among the group

Concluding remarks

The poster presents the study conducted at the Whale Museum of Madeira Island. Given the increasing interest that mobile devices have taken as mediators of museum experiences, the study aimed to verify if audio guides enhance engagement and learning in 9-10-year-old children. To that end, we involved a sample of 25 children and divided them into two groups, one doing the visit with the audio guide and a human guide, and the other one only without the audio guide. Data were gathered through different measurement tools, pre/post questionnaires, and observations. A series of statistical tests, triangulated with qualitative data, led to the conclusion that audio guides enhanced engagement due to its “novelty” effect but hindered learning and social interaction. Although our preliminary results go in this direction, the small sample gathered was a limitation and further studies are needed in order to clarify these results.

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