




Designing Virtual Guides' Characteristics for Remote Tourism in the Arctic

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Abstract. The paper investigates the design of virtual guide characters in the context of remote tourism, focusing on their appearance, characteristics, and effects on the user experience. We created four virtual guide characters for an Arctic tourism context and evaluated them with 15 participants with a design background. In addition, the participants created their own virtual guide character designs by sketching and writing descriptions. The salient findings highlight e.g. that in the virtual guide's design, the personality, local features, and historical authenticity matter for the user experience. However, local stereotypes provoke mixed feelings depending on the audience, and the diverse aspects of design should be paid attention to. The work contributes towards designing remote and more sustainable tourism experiences in the future.

Keywords: Virtual Characters · Character Design · User Experience · Remote Tourism · Cultural Heritage

1 Introduction

Virtual guides are used in digital applications to provide guidance e.g. at tourism or cultural heritage sites instead of a live human guide or to replace guidance signs or texts. Virtual guides have been introduced for virtual museum contexts to engage the visitors through storytelling [26], and for physical museums as a novel way for capturing the attention of different user groups such as children [25]. Also, wearable systems with audio-only guidance to aid the user's navigation are well-known examples [29]. With different mobile applications and remote tours, virtual guides have become increasingly common. Today, remote tourism services are rapidly emerging due to the desire to lessen the carbon footprint of travel. Also, the Covid-19 pandemic gave an additional push for attending different events and attractions virtually [11, 23]. Research on the desired characteristics of virtual guides is now probably more topical than ever.

In this paper, we use the definition that the virtual guide is a conversational digital agent, whose main goal is to give guidance to the user. We do not limit our definition to a certain kind of communication method (text or audio), nor to

a visual style, execution, location, or platform. In this paper, the context is however the Arctic, or rather the sub-Arctic, geographical area. We report a design case for the characteristics of a digital virtual guide, engaging 15 masters-level design students. The data set consists of two parts: guide characters designed by students, and four virtual guide concept designs created by the researcher and evaluated by the student participants. We aim to offer useful information for improving remote experiences and making them more viable alternatives or a supplement, for the physical live experiences. The results reveal what kind of virtual guide characters were found pleasant, or unpleasant, why, and which features were desirable, or irrelevant.

2 Related Work

2.1 Using Virtual Guides

Machidon et al. [16] reviewed different uses of virtual humans for digital heritage has revealed that they are mainly used for two purposes; populating a virtual world or as virtual tour guides. They note how virtual guides have two roles, firstly, as information providers making the tour more interesting, and secondly, as assistants in navigation. Virtual guides can utilize different platforms and technologies, such as virtual reality (VR) or augmented reality (AR) software, or mobile applications. So far, the research focus has often been on the technical implementation instead of the guide's physical appearance. For instance, Abate et al. [1] have created a behavioural framework for synchronized communication and interaction between the user and the virtual character. Bates et al. [3] also point out how (character) artists approach intelligent agents (IAs) from the perspective of emotional expression, while AI (artificial intelligence) researchers take a more scientific and intelligence-focused view.

Virtual guides are often visualised as human avatars, which can be created for example with motion capture technologies. Capturing a virtual human avatar to create a virtual human guide has been described by Karuzeki et al. [12], who have used the technique for the purpose of a virtual guide narrating stories of an old mastic factory in VR. Rzayev et al. [22] conducted a user study comparing a real guide, a realistic virtual guide, an abstract virtual guide, and an audio guide in the context of a museum exhibition using AR glasses. Their study showed how a visual avatar increases engagement compared to an audio-only guide, and the virtual human avatar and real human guide are the best ones for visitors' comprehension. According to Murali et al. [18], instead of the virtual guide's appearance, it is more important to get the character's argumentation, i.e. the communication style and values implicit in the speech, right.

2.2 Character Design

General character design has been detailed in numerous books and research articles across decades and from perspectives of e.g. game design, creative writing,

and animation. The focus of these publications varies from character design practice [24] to cultural specificity and variation [17] and the importance of the game characters to the player. [14]. Character design has also been studied in relation to multiple issues e.g. the uncanny valley [27], stereotypes [7], historical authenticity [15], and believability [17].

When looking at virtual characters with more practical purpose, the literature focuses more on the effects that a character's appearance or other features have in practice. Veletsianos [28] studied how the appearance of a pedagogical agent affected learning when the appearance matched or did not match a stereotype associated with the subject. While users apply stereotypes to pedagogical agents, the effect these stereotypes had on learning were not easily predictable. While Veletsianos's study used characters with matching clothing and varying facial features, Peña and Yoo [20] examined the effect color of clothing had in a virtual store setting and whether being under cognitive load changed the users' perceptions. In their study, the characters with dark clothes elicited more negative responses from the users compared to characters wearing light clothes.

On a broader scale, Elshan et al. [6] conducted a literature review on the design elements of intelligent agents and how these elements affect user acceptance. The authors' findings show that character appearance among other visual design elements affects all three key elements of IAs, relational, social, and functional. But many questions lack definitive answers, for example, character appearance has been shown to affect the trust and rapport between the user and an IA, however, the impact of character appearance seems to vary depending on context.

2.3 Positioning of Our Research

In our research, we focus on the design of virtual guides. The focus of our research is specifically on how can local attributes be communicated through the guide's appearance, and what kind of features or designs the users appreciate. The results seek to reveal what kind of virtual guide characters were found pleasant or unpleasant and why, and which features were desirable, or irrelevant. Our research takes the lens of user experience (UX) design. Roto's [21] model for designing and evaluating UX for products includes three attributes: system, context, and user. UX has been described as the general good-bad feeling with the product [8] and contributing both to hedonic and utilitarian aspects [9].

3 Virtual Guide Design

3.1 Designing the Virtual Guides for Evaluation

The combination of art & design and IT was intertwined in the research from the beginning, as before the participatory design study, the character design phase took place. This functioned as a preparation phase for the study (phase B). The characters were called "Kari", "Ida", "Taival-Tonttu" and "Maija" (Fig. 1). Each



Fig. 1. The four virtual guide character concepts were designed by the first author. From left to right: “Kari and Retu”, “Ida”, “Taival-tonttu” and “Maija”.

character had at least one unique feature and each one was designed to represent a selected aspect of the area that could be interesting to tourists. Three of them were completely fictional and the fourth was based on an authentic historical figure. The character design process was close to ‘art-driven character design’ Ernest Adams describes in his *Fundamentals of Game Design* [2]. In art-driven character design, a character’s appearance is designed first, as opposed to a story-driven process where a character’s role, personality, and behaviour come before appearance. Adams suggests an art-driven design process is more suitable for characters that don’t have complex personalities and that don’t change much during a game. As the focus of the study was on the appearance of a virtual guide, the personalities and backstories of the characters were left at a superficial level. Next, each of the guide designs is presented.

Guide 1 - “Kari and Retu”. Kari was designed as a wilderness guide, representing nature as an attraction for tourism in Lapland. His outfit fits hiking or other activities in the nature. Kuksa, a traditional wooden cup, is a visible part of his equipment and gives him a local connection. As a unique feature, he was given a dog companion Retu. *“Hello! My name is Kari and this is Retu. I know this area better than the insides of my pockets. We will guide you on this tour. We’re ready to start now, right Retu? - BARK BARK!”*

Guide 2 - “Ida”. Ida was designed to be a modern woman living in a city, representing a young and active tourist. Her outfit emphasises the active image without being either overly sporty or feminine. As a unique feature, she was given a bicycle, making her pose different from the other guides. *“Hi, I’m Ida! I live and study here and will be your guide today. I’m ready to start, so just tell me when you want to go”.*

Guide 3 - “Taival-tonttu the Elf”. Taival-tonttu was designed to be a traditional Christmas elf, which is also the character’s unique feature. However, the design does not follow the modern imagery associated with Santa Claus with all-red clothing. A local feature in the character’s clothing are the shoes that

loosely follow the design of traditional Sámi boots “nutukkaat”, made of reindeer hide, and is also used by other ethnicities in the Arctic area [13]. *“Hello! I am Taival-tonntu. I’m 120 years old and I’ve lived here for my whole life. I will guide you on this tour. I’m ready to go with you whenever you want”.*

Guide 2 - “Maija”. Maija is the only one of the characters that is not completely fictional. The character is based on Maija Kellokumpu (1892–1935), an artist from Salla town in Lapland, whose character represents the cultural tourism aspect [10]. The character’s appearance was designed after portraits of Maija Kellokumpu and photographs of 1920s clothing. To match the historical authenticity, it was chosen also not to include any items indicative of her profession to the final illustration. *“Good day! My name is Maija. I’m an artist and I love to paint the nature here. I will guide you today, so tell me when you are ready to start”.*

3.2 Contextual Design Aspects

The images were presented to the participants in the form of mock-up mobile app screenshots, consisting of a character illustration, a speech bubble and a UI of an Android phone. The illustrations were placed on a simple background as there was no single background image that would have suited all guides equally. The speech bubbles included a short introduction by the guide to give some background and tell about their connection to the area. The texts also give additional details about the characters. According to Ernest Adams [2], the way a character speaks carries a large amount of information on the character’s background, like their place of origin, education, and social class. Since the evaluated characters were presented with no audio, accents or other cues conveyed through speech was not available, only slight variance in style and vocabulary was introduced to the character dialogue to make the speech sound more fitting to each character. In order to avoid an uneven comparison, all characters were drawn smiling and in poses that showed their faces fully, from the front or from a 3/4 angle. Previous research suggests that in a gamified or game-like application, characters based on historical figures can increase the user’s interest in the content [15]. Including one virtual guide character based on a real historical figure allowed us to further explore this.

4 Data Collection and Analysis

4.1 Data

The student participants were university design students ($n = 15$), where 8/15 were from Finland and 7/15 were from Asia and Europe, all physically present in the same city, Rovaniemi, Lapland. The participants were between the ages of 19 to 32, with the median age being 24. In **phase A**, the students created virtual guide designs. The task included drawing a virtual guide, and describing it in writing. The students were also asked what are the most important features

of a virtual guide. The task resulted in 15 different designs, which were then categorised by different features and analysed by the researchers.

In **phase B**, we investigated and evaluated the design and characteristics of pre-designed virtual guide characters (Fig. 1) with a survey. The same questions were asked about each character: 1. What kind of first impression does the character give? 2. What kind of image of Lapland does this character convey? 3. What do you like about this character? 4. Do you think there is anything unpleasant or problematic in this character? If yes, what?

After answering these questions about all guides, the participants ranked the characters from best to worst. Finally, they were asked two additional questions: one about the differences between a virtual and a real guide, and another about their opinions on using authentic historical characters.

4.2 Analysis

In the analysis, we used a qualitative research method, Constructivist Grounded Theory [4], as the upcoming categories were grounded in and emerging from the data, rather than sought to fit in an existing theory or framework. Parts of the data were analysed by creating codes from recurring themes in the responses. Two researchers first did the initial distribution into themes individually, and then, through an iterative process and discussions, developed a codebook to be used in the final coding of the responses. Responses were marked with the codes, first by the two researchers who created the codebook and finally by a third neutral researcher who had no previous knowledge of the study. The coding analysis was used on three sections of the data: the question about important features of a virtual guide in phase A, the comparison of virtual and real guides in phase B, and the evaluation of premade characters in phase B. The same set of codes was used on all four premade characters to enable comparison. These sections are later referred to as code categories Important Features (IF), Differences (D), and Guide character evaluation (G).

Other methods than coding were also used. Character sketches and accompanying written descriptions made by students in phase A were classified and sorted by their design features. The classification is loosely based on the structure presented by Egri [5] and modified by Lankoski et al. [14], which has three main categories: physiology, sociology, and psychology. Our classification was further adjusted to better reflect the character designs made in phase A, as they were created in a short time and did not include backstories or complex descriptions of personality. Figure 2 illustrates examples of designs classified as human, animal, and other. Additional questions from phase B (comparison of virtual and real guides, and using historical characters) were analysed without coding because the varying nature of the answers combined with the limited amount of participants would have created a large number of codes, each with few uses.

5 Results

In the following, the quotes from participants will be referred to by participant numbers, between #1 and #15.

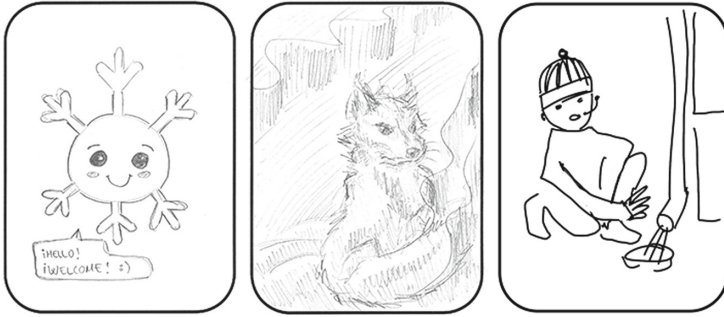


Fig. 2. Examples of the virtual guide design sketches from the participants, a snowflake, an arctic fox, and a city guide.

5.1 Character Designs by Participants

In phase A the participants were provided with an empty template and pencils where they could sketch their guide design and write about it for 30 min. Two remote participants completed the task digitally. Most of the participants' virtual guide designs were animals (6), for example, a reindeer and an arctic fox, there were 5 other types of designs, including non-living objects, such as a snowflake avatar. The rest, 4 designs, were classified as humans. Some interesting guide design examples included a guide changing its location on the screen, a remote-controlled drone as a guide, which could show places that humans cannot access, a data cube that could show emotions by changing color or voice frequency, and an avatar that would change its looks based on the season.

In 7 out of the 15 design templates, audio was discussed, including using a microphone, speech, and AI audio. The guiding style for most designs (9), included a visible avatar, 6 guides used voice/audio, and 5 included a text chat. Half of the participants (7/15) mentioned the voice in their own guide design sketch or description, making it an important feature. The mentions included e.g. an AI voice (#13) and voice actors (#3). Three participants specifically described the way how their guide expresses emotions, for example, "Hinted emotions via distortion frequency and colors" (#13), and "They speak human language and have body language to express emotions" (#8). Some of the designs also referred to an emotion the guide should express, either being friendly (mentioned 3 times) or fun (2 times). The topic of the guided tour was most often nature (6), or a general tour (3). Other examples of topics, mentioned once each, included culture, city, and food. When asked to design and describe a guide, many participants included a connection to Lapland through visual cues or topic of the tours or both. Visual features that had a local connection included local animals, e.g. a reindeer and lynx, and natural elements, such as the northern lights.

5.2 Virtual Guide Features

Perceptions of the most important features of virtual guides are presented in Table 1. The participants valued functional features more than appearance and in fact, in the responses to the survey question asking the most important features of a virtual guide, the appearance was not mentioned at all. A smooth user experience and the good quality of the delivered content were the most valued qualities. The most common code was Communication (8 occurrences), such as how the guide should be good verbally (#12) and also communicate with facial expressions (#7). The limited way a conventional chatbot communicates was disliked (#11). The second most important code was Knowledge (7), such as having "...information, wisdom, knowledge.." (#13), and know lot about the topic (#11). Third most popular code categories were Interaction (6), such as being able to answer basic questions (#5) and "remembering to interact with the viewers" (#12), and Personality (6), described for example as being furry and friendly (#7), or as looking friendly and approachable, possibly with features of the artifact that shows the cultural identity of a particular place." (#8). The code for Stories got 5 mentions, such as "...nice voice and interesting narrative." (#5). The rest of the codes, i.e. Audio, Accessibility, and Technical quality, each occurred 3 times.

Participants were asked to compare a virtual and a real-world guide, and the coded results are presented in Table 1. Here, the most popular category for answers related to Digital possibilities, described e.g. as a virtual guide being "better for tooltips and hints, and a mascot created with the software" (#13), and for being always available (#10). One participant noted how a "virtual guide could be anything, so why limit the options to the guides that could also be in real life?" (#3). The second popular code was Functionalities with 6 mentions, including challenges about how it is "difficult to communicate with a virtual character" (#9). The next popular codes (4) were Interactivity, such as preferring a real guide when one wants to ask questions (#5), Usability, and Content, e.g. "If the stories are classical or historical, it sounds like fictional guides have greater potential in storytelling." (#8). The remaining codes, Senses, Appearance, and Experiences, were each mentioned by 2 participants.

Table 1. Amount of code occurrences in 'important features' and 'differences between real and virtual guide' categories.

Important features	Code	Amount	Differences	Code	Amount
IF3	Communication	8	D5	Digital possibilities	7
IF7	Knowledge	7	D7	Functionalities	6
IF1	Interaction	6	D2	Interactivity	4
IF5	Personality	6	D4	Usability	4
IF6	Stories	5	D6	Content	4
IF2	Audio	3	D1	Senses	2
IF4	Accessibility	3	D3	Appearance	2
IF8	Technical quality	3	D8	Experiences	2

5.3 Evaluating Pre-designed Characters

In phase B the participants evaluated the four characters designed in advance by the researchers. In the Guide character evaluation code category, the three most popular codes were Personality (occurring 44 times), Unique features (43), and Appearance (26), Table 2. Of these, personality was the most frequently used code for Kari and Ida characters (13 times), and unique features were the most frequently used for Taival-tonttu and Maija (13 times). Appearance was more moderately mentioned, as it was the third most used code with Maija (9), and less the other three characters (Kari and Ida 6 times and Taival 5 times).

Code G5, Personality was used for descriptions of the guide’s perceived nature and behaviour. Some examples of this included Kari described as “Tough, masculine, adventurous” (#8), Ida as cheerful and friendly (#10) and Maija as “..bit too calm” (#12). Code G1, Unique features was used when participants mentioned the features that only one guide had, which were a dog for Kari, a bicycle for Ida, being a Christmas elf for Taival-tonttu, and being a historical character and an artist for Maija. For Kari, someone commented how “its kinda sad that the dog only says ‘bark’” (#7). Taival-tonttu was seen as a “generic Christmas elf, maybe a bit too commercial or touristy, but looks a bit less stereotypical than the usual Christmas elves” (#3). Code G11, Appearance was used for any general mention of the character’s look e.g. colors of their clothes or hair. Ida’s appearance was commented as “Young and fresh image of a guide” (#6) and Maija’s as “Historical, because the clothes are not modern” (#13). The code for Environment was mentioned 21 times in total for all guides, and it was the third most popular code for Kari (8), mentioned e.g. in the connection with wilderness exploration (#8). The code for Local features occurred 20 times for all guides and was the second most popular for Taival-Tonttu, him being described as giving a “very traditional Laplandish impression” (#15). Code for Activities received 19 mentions, with it being the second-most popular code for Ida, e.g. a mention of how her having a bicycle could encourage the tourist to also use one (#7).

Table 2. Amount of codes in the ‘guide character evaluation’ category.

Guide code no	Code	Kari	Ida	Taival	Maija	Sum
G5	Personality	13	13	6	12	44
G1	Unique features	11	6	13	13	43
G11	Appearance	6	6	5	9	26
G6	Environment	8	3	6	4	21
G2	Local features	2	3	11	4	20
G3	Activities	6	10	1	2	19
G8	Stereotype	6	2	8	2	18
G10	Target group	6	2	6	1	15
G4	Diversity	2	5	5	2	14
G7	Equipment	3	4	3	3	13
G9	Gender	4	3	1	4	12

In phase B the participants were also asked to rate the guides from 1 (best) to worst (4) and give a reasoning for their choices, the ratings for each guide are presented in Fig. 3. Two of the respondents had misunderstood the order of the rating, so their responses were reversed according to their textual answers. Kari was the most voted guide for the best choice, but Ida seemed to be the most neutral, as she got no votes for being the worst. Personality proved to have a fairly significant role in character ranking. Of the three participants that ranked Kari worst, two cited his personality as the reason (#1, #15) while the remaining one justified their ranking with diversity issues (#3). A few participants that ranked Kari the best talked about his personality, such as his perceived reliability (#5, #14). Most participants placing Ida first also described her personality, which they deemed e.g. approachable (#1, #8, #15) and fresh (#1, #6). With Taivaltonnttu, the ranking seemed to have less to do with his perceived personality and more with him being a Christmas elf. With Maija, one participant ranked her the best based the ranking on their own interest in cultural topics and finding her the most relatable (#10). Some of the participants ranking Maija the worst also cited her perceived personality as a reason, as they saw her as too quiet and obedient (#4, #5).

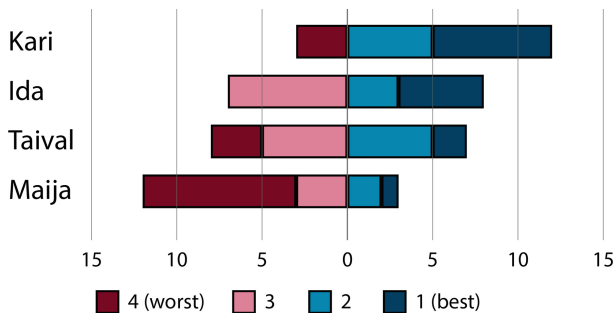


Fig. 3. The numerical ratings of the guides ranging from 1 (best) to 4 (worst).

The guide characters' connection to the local area through visual cues also carried weight in the character ranking. The participants ranking Kari the best cited his suitability to the northern environment as the reason even more than they did his personality (#2, #4, #8, #12). With Maija, 3 of the 9 participants ranking her worst mentioned her lacking a local connection (#6, #8, #13), 3 said she lacked unique features (#9, #11, #12), 2 mentioned her personality (#4, #5) and 1 justified the ranking with her not being able to perform well in the local environment and the wilderness (#2). In addition, after finding out Maija was based on a real historical person, some people said they would raise their evaluation of her, as they thought it increased her local connection through the historical link. Ida also received some criticism for her lack of local connection (#7, #8, #10), but none of the participants rated her worst. This may have been because her personality was deemed more likeable than Maija's or because

she seemed to have at least some local connection. One participant described Ida as looking like the local students (#7). Some of the guides were designed with summer clothes. For instance, with Ida it was commented that her “clothes look cold” (#9). Maija provoked feedback that her outfit, a summer dress, was not the most practical and not warm enough (#3). It should be noted that the research study was conducted in November, with snow on the ground.

5.4 Effect of Historical Connection

The character Maija was based on an authentic historical figure, but this was initially not revealed to the participants. The information was given out after the character evaluations and ratings, followed by a question about whether this information changed their assessment of Maija in any way. Half of the responses given were generally positive (7 responses), 4 responses were generally negative, and 3 were somewhat mixed. The 7 positive responses included 4 wanting to give Maija a higher rating because she was based on a real historical person.

Historical links, enabling the character to have a more solid connection to Lapland (#10) or to the participants personally (#11) were also mentioned as positive arguments. Negative responses included the participants feeling that the historical connection did not make the character any better (#1, #2) or that the character was not really recognizable as someone from the past (#3). One participant felt that using a historical person as a guide character demonstrated poor taste and words should not be put into a person’s mouth (#13). Here, a fictional character was seen to provide more artistic freedom (#13).

6 Discussion

6.1 User Experience and Digital Possibilities

Communication and personality emerged as prevailing themes in the participants’ comments as important virtual guide characteristics. Participants called for pleasant and effortless communication and interaction. A virtual guide should be technically advanced enough to enable a natural conversation that resembles interaction between two real humans. For virtual agents, emotional expression [3] and social skills [6] are aspects that affect user acceptance and believability. The user experience aspects related to character emotion design and expressiveness are, according to our study, important. The personality of the character was highlighted and commented on at several points in the study. The personality was inferred from different details of the character design and influenced how appealing, interesting, and trustworthy the guide was perceived. Thus, the characters’ perceived personality can affect the user experience and acceptance.

In the analysis, Digital possibilities and Functionalities were the most frequent codes. When designing virtual guides, using technology to augment and enhance reality instead of only mimicking it is possible. Innovative and perhaps unrealistic digital characters or different kinds of avatar guides could be interesting for the visitors, and would utilise the digital nature of the guide more

comprehensively. Digital possibilities also provide means for customisation of the characters. As the preferences with virtual guide characters varied individually by the participant, it is also relevant to consider if users should be given an opportunity to select between characters, rather than be forced to use a pre-defined character. This, however, may influence the branding and user experience design constraints set by the service provider and needs to be considered with respect to these conditions.

6.2 Appearance, Personality, and Senses

The virtual guide characters created for this study were not given extensive personalities, so the participants' perceptions of their personalities were based on single pictures and very short introductory dialogue. Despite this, the participants mentioned personality more frequently than other features, closely followed by the character's unique features. In general, people have a tendency to judge other people's personalities based on their appearance [19]. Even with limited information, the personality of the guide character was important to the participants. Especially the appearance was an important characteristic in perceiving the guide's personality. In addition to the appearance, the dialogue and character's body language influenced determining the characters' personality. Rzayev et al. [22] suggest that a realistic virtual guide receives higher scores in co-presence compared to an abstract or audio-only guide without distracting the user's learning process. Thus, the effect of a guide's type (human or non-human) should be taken into consideration in their design. Among students' own guide designs, animal characters were the most popular category, and their ability to express emotions was mentioned.

Some participants were heavily focused on the audio and voice of the guide, even though it was not mentioned in the survey questions, and all the material was visual. One participant said that the appearance does not matter at all, they would just like an audio guide (#1). These kinds of guides have been tested for e.g. navigation [29] Giving users the possibility to choose between visible or audio-only guides could enable the users to focus solely on the information or stories provided by the guide, without distracting visuals. As discussed next, local features appeared to be an important part of a guide design, so there would be a need to consider, how to implement local features in an audio-only guide without compromising clarity and accessibility.

6.3 Local Features and Diversity

Some of the participants were commenting on the guides' lack of local features, for example saying that Ida could be from anywhere in the world. Based on this, a virtual guide should preferably have certain design elements that directly point out the local context to the visitors. On the other hand, it should also be noted how stereotypes of local people can reinforce negative images. Interestingly, some participants mentioned the equipment of the guide when evaluating the characters - whether they seemed well-prepared for the weather or an activity,

or if they had clothes that were not suitable for the season. For instance, a virtual guide character's clothes could be adjustable or reflect the current weather in the area. This is especially relevant where the weather depends on the season. This could be even a way to promote the seasonality of the area. Indeed, participant-created guide designs included an avatar with four different seasons visualised. Methodologically, it is interesting to consider if the winter season at the time the study was organized affected to the comments on guide designs' summer clothes.

Designing with the locality in mind also has the possibility to bring out the local history and cultural heritage. In this study, we compared the reception of a historical figure as a guide compared to completely fictional ones and the responses indicate a positive attitude towards historical figures as guides if it is done correctly and respectfully. A larger sample would be needed to further study the differences in reception between a completely fictional guide character and a character based on a historical figure.

The theme of diversity emerged very strongly in the answers of some individual participants. These participants also used diversity as a basis for their character ranking. This angle resulted in quite a lot of critique of the character Kari, who was now seen to match with a generally used image of a wilderness guide as a white man (#3, #1). On the other hand, one participant made a remark concerning Ida, commenting how it was relaxing to see someone that they could identify with as a student (#15). Occasionally the participants commented on certain guides fitting certain target groups, such as Ida with a bike to physically active people, or Taival-tonttu the Elf to children. Keeping the target group in mind is a good practice in any design and software development project, and it is important to understand the design context the work takes place [8].

6.4 Limitations and Future Work

As limitations, we acknowledge the small sample size in the study and the research method. The study only had 15 participants, who all were design students, and the results can't necessarily be generalised for all demographics. The evaluations were done using static mock-up images, and not conducted in situ with a functional prototype. This leaves out several aspects of virtual characters, such as movement and speech. Further research should include creating a software prototype and testing it in a more realistic setup, and deeper research on the historical or anthropomorphic character design.

7 Conclusion

Based on our findings, the most important characteristics of a virtual guide related to interactivity and communication, as well as local features and personality. Concerning virtual guide characters based on historical figures, our findings indicate positive reception towards this kind of guide. Instead of imitating real-life guides, our findings suggest to better utilize digital possibilities with guide characters and this way create unique experiences.

Acknowledgements. This work has been supported by the project “Innovation in Lapland through Design and Art”, funded by European Regional Development Fund (ERDF), and Regional Council of Lapland. We also wish to thank University of Lapland and Lapland University of Applied Sciences for their support.

References

1. Abate, A.F., Acampora, G., Ricciardi, S.: An interactive virtual guide for the AR based visit of archaeological sites. *J. Vis. Lang. Comput.* **22**(6), 415–425 (2011)
2. Adams, E.: *Fundamentals of Game Design*, pp. 181–204. New Riders, New York, US (2014)
3. Bates, J., et al.: The role of emotion in believable agents. *Commun. ACM* **37**(7), 122–125 (1994)
4. Charmaz, K.: *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. Sage Publications, Thousand Oaks (2006)
5. Egri, L.: *The Art of Dramatic Writing: Its Basis in the Creative Interpretation of Human Motives*. Simon and Schuster (1972)
6. Elshan, E., Zierau, N., Engel, C., Janson, A., Leimeister, J.M.: Understanding the design elements affecting user acceptance of intelligent agents: past, present and future. *Inf. Syst. Front.* 1–32 (2022)
7. Haake, M., Gulz, A.: Visual stereotypes and virtual pedagogical agents. *J. Educ. Technol. Soc.* **11**(4), 1–15 (2008)
8. Hassenzahl, M.: User experience (UX) towards an experiential perspective on product quality. In: *Proceedings of the 20th Conference on l'Interaction Homme-Machine*, pp. 11–15 (2008)
9. Hassenzahl, M., Tractinsky, N.: User experience-a research agenda. *Behav. Inf. Technol.* **25**(2), 91–97 (2006)
10. Hautala-Hirvioja, T.: Maija kellokumpu: lappilaisen naistaiteilijan mahdollisuudet ja rajat 1920- ja 1930-luvulla. In: *Tavallisen epätavallisia naisia: historian naisten elämänvalintoja pohjoisessa*, pp. 65–83. Lapland University Press, Rovaniemi (2013)
11. Karhu, M., Suoheimo, M., Häkkinen, J.: People's perspectives on social media use during COVID-19 pandemic. In: *MUM 2021: 20th International Conference on Mobile and Ubiquitous Multimedia*, pp. 1–13. Association for Computing Machinery, New York (2021)
12. Karuzaki, E., et al.: Realistic virtual humans for cultural heritage applications. *Heritage* **4**(4), 4148–4171 (2021)
13. Kugapi, O.: “Se on sydämen asia se saamenkäsityö”: matkailun vaikutukset saamelaiseen käsityökulttuuriin ja kulttuuri-identiteettiin. Master's thesis, University of Lapland (2014)
14. Lankoski, P., Heliö, S., Ekman, I.: Characters in computer games: toward understanding interpretation and design. In: *DiGRA Conference* (2003)
15. Luiro, E., Hannula, P., Launne, E., Mustonen, S., Westerlund, T., Häkkinen, J.: Exploring local history and cultural heritage through a mobile game. In: *Proceedings of the 18th International Conference on Mobile and Ubiquitous Multimedia*, pp. 1–4 (2019)
16. Machidon, O.M., Duguleana, M., Carrozzino, M.: Virtual humans in cultural heritage ICT applications: a review. *J. Cult. Heritage* **33**, 249–260 (2018)

17. Maldonado, H., Hayes-Roth, B.: Toward cross-cultural believability in character design. In: *Agent Culture: Human-Agent Interaction in a Multicultural World*, pp. 143–175. Lawrence Erlbaum Associates, New Jersey (2004)
18. Murali, P., Shamekhi, A., Parmar, D., Bickmore, T.: Argumentation is more important than appearance for designing culturally tailored virtual agents. In: *Proceedings of the 19th International Conference on Autonomous Agents and MultiAgent Systems*, pp. 1940–1942. International Foundation for Autonomous Agents and Multiagent Systems, Richland (2020)
19. Naumann, L.P., Vazire, S., Rentfrow, P.J., Gosling, S.D.: Personality judgments based on physical appearance. *Pers. Soc. Psychol. Bull.* **35**(12), 1661–1671 (2009). <https://doi.org/10.1177/0146167209346309>, <https://doi.org/10.1177/0146167209346309>. PMID: 19762717
20. Peña, J., Yoo, S.C.: Under pressure: avatar appearance and cognitive load effects on attitudes, trustworthiness, bidding, and interpersonal distance in a virtual store. *Presence* **23**(1), 18–32 (2014)
21. Roto, V.: User experience building blocks. In: *The 2nd cost294-mause international open Workshop*, vol. 14 (2006)
22. Rzyayev, R., Karaman, G., Henze, N., Schwind, V.: Fostering virtual guide in exhibitions. In: *Proceedings of the 21st International Conference on Human-Computer Interaction with Mobile Devices and Services*, pp. 1–6. Association for Computing Machinery, New York (2019)
23. Samaroudi, M., Echavarria, K.R., Perry, L.: Heritage in lockdown: digital provision of memory institutions in the UK and us of America during the COVID-19 pandemic. *Museum Manage. Curatorsh.* **35**(4), 337–361 (2020)
24. Sloan, R.: *Virtual Character Design*. Taylor & Francis Group, Boca Raton (2015)
25. Swartout, W., et al.: Ada and grace: toward realistic and engaging virtual museum guides. In: Allbeck, J., Badler, N., Bickmore, T., Pelachaud, C., Safonova, A. (eds.) *IWA 2010. LNCS (LNAI)*, vol. 6356, pp. 286–300. Springer, Heidelberg (2010). https://doi.org/10.1007/978-3-642-15892-6_30
26. Sylaiou, S., Kasapakis, V., Gavalas, D., Dzardanova, E.: Avatars as storytellers: affective narratives in virtual museums. *Pers. Ubiquit. Comput.* **24**(6), 829–841 (2020). <https://doi.org/10.1007/s00779-019-01358-2>
27. Tinwell, A., Grimshaw, M., Nabi, D.A., Williams, A.: Facial expression of emotion and perception of the uncanny valley in virtual characters. *Comput. Hum. Behav.* **27**(2), 741–749 (2011)
28. Veletsianos, G.: Contextually relevant pedagogical agents: visual appearance, stereotypes, and first impressions and their impact on learning. *Comput. Educ.* **55**(2), 576–585 (2010)
29. Xu, Q., Li, L., Lim, J.H., Tan, C.Y.C., Mukawa, M., Wang, G.: A wearable virtual guide for context-aware cognitive indoor navigation. In: *Proceedings of the 16th International Conference on Human-Computer Interaction with Mobile Devices & Services*, pp. 111–120. Association for Computing Machinery, New York (2014)