

Article

Ksar Said: Building Tunisian young people's critical engagement with their heritage

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Abstract: This paper describes the work undertaken as part of the *Digital Documentation of Ksar Said* Project. This project, funded by the British Council, combined education, history, and heritage for the digital preservation of tangible and intangible aspects of heritage associated with the 19th century Said Palace (Ksar Said) in Tunis. We produced an interactive 3D model of Ksar Said and developed learning resources to build Tunisian students' critical engagement with their heritage through inquiry learning activities within the 3D model. We used a user-centred approach, based on pre-assessment (i.e., co-creation of contents), mid-term evaluation (i.e., feedback on contents and preliminary design of virtual activities), and post-assessment design (i.e., user trial). Our results demonstrate the potential of this novel approach to virtual learning and inform future co-design, evaluation and implementation choices for improving the generative power of three dimensional virtual replication of heritage sites in the cultural heritage sector.

Keywords: Virtual Reality; cultural heritage; historical thinking; inquiry; critical design; co-creation; critical heritage; evaluation; Ksar Said; 3D replicas of heritage at risk.

1. Introduction

In countries affected by conflict, there are often contested narratives about a country's history and heritage, beliefs and faiths, culture and identity [1]. Because these narratives are strongly held, it is difficult to reach consensus between different groups (religious, ethnic etc.) about the accepted historical narrative of a country. In such countries, it is crucial to equip students with tools to enable them to reflect on histories, rather than history, and to think about their personal and community connections to their heritage, rather than trying to teach an agreed historical narrative [2, 3]. Heritage is separate from history, because it is concerned with the "re-packaging of the past for some purpose in the present" [4]. Education must take into account, from an early age, how the past, and especially the 'difficult' past [5] is negotiated in the present. In conflict-affected countries, heritage is about making sense of the past to inform children's understanding of present or recent conflicts.

Engaging young learners in historical inquiry [6] can be a fruitful approach to heritage education. This method aims to support students to inquire about their heritage using similar approaches to those used by a professional historian. The development of such inquiry-based activities in virtual heritage environments may be a creative and accessible way to engage young learners with the richness of their heritage [7]. Such activities enable children to follow their own

lines of inquiry, engaging with the ideas autonomously, within pre-defined foci (i.e., selected themes). Based on these premises, in 2017 we developed an online project combining virtual reality (VR) and historical inquiry to engage young Tunisians with learning activities related to the rise of their nation in the context of their built heritage. The project started from the digital documentation of Ksar Said, the final residence for the last Ottoman Beys (rulers) of Tunisia. The main assumption was that increasing understanding of the complex and varied influences that have culminated in the nation as it is today can help to develop a culture of critical understanding of historicity and heritage values so that the diversity of Tunisian Heritage will be appreciated and protected. The project was funded by the British Council Cultural Protection Fund and had two aims: 1. The high-resolution documentation of the Palace using laser scanning technology for the long-term preservation and monitoring of the building. 2. The development of educational activities to foster young learners' engagement with the history of the Palace and more broadly with Tunisian heritage. This paper will focus on the process of co-creation of the online educational contents and will emphasize the reflexive approach adopted for the creation of the final online outcome. We co-designed and evaluated the inquiry-based activities to examine how such inquiry could foster children's understanding of their heritage. The findings suggested that the use of inquiry questions within a virtual heritage environment can help primary and secondary age students to access and reflect upon their heritage, across different historical era. The educational platform is available online at <http://ksarsaid.net> [8].

The remainder of the article is organized as follows.

Section 2 presents the theoretical framework underlying the project. Section 3 presents the case study, with specific reference to why the Palace was selected to exemplify the rise of the nation, and with reference to the 3D digital documentation process (i.e., laser scanning and subsequent data optimization for the online platform). Section 4 introduces our process of design and evaluation of the online platform and associated educational contents. Section 5 presents the results of the main phases of design and evaluation. Finally, Section 6 concludes by discussing strengths and limitations of this project, its implications for the heritage field and future research directions.

2. Theoretical framework

Heritage is concerned with the re-packaging of the past for some purpose in the present. When children try to make sense of their history, and work out what it means for them, they are reflecting on their sense of heritage. This kind of 'intangible' heritage is important; the meaning which a child makes from real historical buildings and artefacts is important to their identity and their understanding of the history of their country or their local environment [8, 9].

2.1 Learning through Inquiry

While historical inquiry [6] is specifically used to help a student to ask questions about history, it may also be a valuable way to reflect on how layers of history build up, and are selected, negotiated and celebrated in the past and in the present [10, 11]. In other words, historical inquiry can be an invaluable method to help a student to reflect on the complexity of history and heritage. Historical inquiry involves students asking and answering questions about people, objects, buildings and artefacts, such as 'what is it?', 'why is it significant' and 'what does it mean to us today?'. Questions are asked which begin with 'Who?', 'What?', 'When?', 'Why?' and 'How?'. Students decide upon evidence needed to answer those questions, they interpret the evidence, and explain and communicate the meaning of the evidence. In doing so, they engage with key historical concepts, including:

- Continuity and change. For example, exploring questions like 'How did society change?', 'Why did society change?', 'What stayed the same?', 'Did change last a long time?'
- Cause and consequence. For example, exploring questions such as 'What caused it to happen?', 'What are the consequences of what happened?', 'What can we learn from what happened?'
- Historical significance. For example, exploring questions such as 'Was it significant?', 'Why was it significant?', 'How significant is it?'

- Use of primary sources. For example, looking at historical documents and artefacts, and asking what information can be gained from them, who wrote them, why they were written in particular ways, and what possible explanations could there be for how they are written. Taking a historical perspective. For example, examining ‘How did people react?’, ‘Did different people react differently?’, ‘Why did people react differently?’, ‘How did people’s reactions cause change?’

Students who engage with one or more of these concepts, are asked to work on several phases of inquiry, which include:

- Making observations, asking questions, developing hypotheses, planning what evidence to collect
- Collecting and collating evidence to confirm or refute their original ideas.
- Interpreting and analysing the evidence
- Concluding and communicating
- Discussing and reviewing the evidence

By involving children in inquiry, they increasingly take initiative, and become more autonomous and self-directed. Such inquiry can also enable children to go beyond ‘collective memory’ and become more critically analytical of the bases for identities they already hold [12]. Because of this, their learning builds on, and goes beyond, their existing ideas and understanding. We believe that the main strength of the historical inquiry method resides on the fact that the conclusions students make are not definite, which means that the words *probably*, and *possibly* are essential for students to use. Students cannot engage in historical inquiry if they spend all lesson listening to the teacher. They need alternative and appealing opportunities to reflect upon their cultural heritage.

2.2. Virtual Reality in Education

Virtual Reality (VR) platforms can provide a good first step to enacting inquiry ideas into teaching and learning. Such platforms can enable children to follow their own lines of inquiry, engaging with the ideas autonomously, within pre-defined foci. Using a pedagogical framework, such as historical inquiry, in combination with a virtual reality environment, may therefore have utility in maximising students’ learning and thinking; using any sort of virtual environment alone is not a guarantee of student learning [13, 14]. That said, virtual environments have a number of affordances: such environments can capture students’ interest and imagination, and online virtual reconstructions of monuments and sites can respond to common interests between young learners, and interests in new media, gaming, and hands-on activities [7, 15, 16, 17, 18, 19]. When engaging in historical inquiry, a virtual environment enables students to move in the virtual representation of historical and heritage sites to seek sources of evidence that will allow them to: make conclusions on the basis of evidence; consider if they are trustworthy or useful to a particular inquiry; make their own judgements and build their own conclusions; discuss and communicate their answers; and realise which inquiry process or historical concept they are working on. They allow students to learn from non-symbolic first person and group experience [20, 21, 22, 23] and can encourage or require collaboration and provide a social atmosphere [16, 17, 19]. Such collaboration can be important for effective learning. Importantly, VR provides a very open format for users to make decisions. Scenarios in adventure games can be very linear, constraining students’ learning. The inquiry process places emphasis on students’ own decision making; for example, VR allows for repetition (revisiting a location, or doing an activity more than once). This kind of repetition also expands students’ learning opportunities beyond the regular class schedule and spaces, with proven benefits for the learning experience [15, 16, 24, 25]. Finally, VR encourages active participation and a user-centred approach [26] (p. 37), which is also enhanced by the inquiry approach, suggesting that VR and historical inquiry can be naturally combined to increase critical engagement with history and heritage. To summarize, it is important to state that we avoided simply adopting a gamification approach; our intention was to prioritize the pedagogical model of inquiry, building students’ autonomy in their learning and enhancing the role of discussion. As such, the panoramas provided authentic access to evidence which students were asked to consider in their inquiries, but allowed

them to feel ownership of their learning, rather than being distracted by mastering aspects of a game format. Of course, such inquiries are possible using video fly-throughs or images of the palace to provide evidence sources, but by situating the palace within a VR environment, we hoped to build students' immersion, engagement and enjoyment of the activity, giving a sense of place which we hoped would enable them to situate themselves historically to build understanding of their heritage.

3. 3D digital documentation of Ksar Said

The Digital Documentation of Ksar Said project was aimed at promoting Tunisian heritage, starting from the story of Ksar Said, through engagement with a 3D experience combined with the novel pedagogical approaches discussed above.

3.1. Background: Why did we choose Ksar Said? What does this monument represent for Tunisians and Tunisian Heritage?

Ksar Said is a former Tunisian Beylic Palace located in Bardo, on the outskirts of Tunis. It contains a wealth of architectural and decorative features which reference Tunisia's rich cultural history and its Roman, Punic, Ottoman, modern European (Italian, French), Arab (including Andalusian) and Islamic influences. It was the final residence for the last Ottoman Beys of Tunisia, but despite its grandeur, it was locked up for nearly a century.

The Palace is unique in Tunisia, as it represents aspects of the country's heritage which were overlooked by earlier regimes, prior to the Revolution in 2011. The Palace has associations with many of the early achievements of the country, including abolition of slavery, and the first written constitution in the Arab-Muslim World. In essence, this monument is a microcosm of Tunisian history, combining both tangible architectural evidence and intangible associations with the myriad aspects of the nation's history. The Palace fell into disuse some 50 years ago and has been slowly deteriorating ever since. Through the recent efforts of the Rambourg Foundation, it has once again become accessible to local people through the exhibition "The Rise of a Nation" [27]. The exhibition attracted enormous attention in Tunisia and was attended by over 25,000 people in less than two months. The exhibition, and the Palace which hosts it, have hugely increased the awareness of the emergence of Tunisia as a nation: its role in abolishing slavery, its democratic and inclusive constitution, its role and its relationship with the great empires of recent centuries and its identity as a modern Muslim state - the seed from which the Arab Spring emerged. The success of the exhibition has demonstrated a real interest in such cultural experiences across a wide range of Tunisian society. Following the success of the exhibition and renovated interest in the Palace and its history, this monument is currently undergoing restoration and will soon become the Museum of the Nation. This work was carried out under a collaboration between the Rambourg Foundation and the Institute Nationale du Patrimoine (INP).

The re-emergence of the Palace into public awareness provided an opportunity to build on the momentum that the exhibition had started. The values represented by the Palace, and by the inquiry activities embedded within its virtual reconstruction, provide an opportunity to build upon the kinds of educational reform which can help to prevent young people from adopting extremist ideologies [28]. On a more pragmatic level, many Tunisians cannot afford to visit Tunis and its major monuments, exposing them to disaffection with an important aspect of their cultural heritage. The aim of the Ksar Said project was to bring the Palace to most Tunisians, with particular attention to young people.

Based on these premises, our project was characterised by two main objectives: (1) digitally preserve Ksar Said to allow future interventions of restoration in the building; (2) use innovative approaches to engage young Tunisians in their cultural heritage, both in co-creating the learning activities, and in using those activities, with a view to raising awareness of the diverse influences that make up modern Tunisia.

3.2. 3D documentation and visualization

3.2.1. From Digital Preservation to Future Physical Restoration

The first phase of the project was to undertake the scanning of the interior of the Palace for long-term preservation and monitoring purposes. We, used a Faro Focus 3D Laser Scanner and preferred this documentation method to others (e.g. Structure from Motion) [29, 30, 31] due to its ability to record large buildings in a short period of time without losing the finest details of the architectonic elements [32, 33, 34, 35]. Laser Scanner technologies have also been demonstrated in recent decades to be valuable tools to monitor buildings, favouring restoration planning and interventions on built heritage at risk [36, 37].

Due to the complexity and dimensions of the Palace [38], and the limited time and resources available for this project, it was impossible to acquire the whole building. For this reason, professionals from the INP and Rambourg Foundation working on the maintenance and restoration of the Palace guided us in an accurate exploration of the building to illustrate the different phases and the evolution of its architectonic history and identify the key areas to document. The choice considered the preservation conditions and the historical relevance of the different parts of Ksar Said in relation to the research objectives of this project. As a result, we opted to select the rooms which bore the most significant historical influences and which would serve to illustrate the breadth of influence of cultures that exist in present day Tunisia, including Roman, Punic, Ottoman, modern European (Italian, French), Arab (including Andalusian) and Islamic. We did not scan areas of the Palace that have been subjected to major changes; for example, when the Palace was used as a hospital with, many rooms being adapted for this use.

During the course of the data capture process we involved the staff at the Palace, providing specific training on the various technologies used during the project (e.g. laser scanning and panoramic photography), and the benefit of integrating the different techniques for the effective digital preservation of the Palace (see Figure 1). The active participation of professionals that work in the Palace on a day-to-day basis, was crucial to increase awareness of the importance of developing long-term strategies for the preservation of Tunisian built heritage. To facilitate the development of durable preservation strategies and practices, we donated a panoramic camera to the INP.



Figure 1. Ksar Said: Laser scanning acquisition and training.

We produced an accurate 3D replica of the palace setting a millimetric resolution for each scan (Resolution Setting: 1/4; Point Distance at 10 m: 6.14 mm). To avoid redundancy in the final 3D point cloud, we tried to minimize the number of scans. The total number of produced scans was 55 for a total of 14 rooms. The number of scans for each room varied based on complexity and dimension of

the space to be acquired (i.e. 3-4 scans for the smaller rooms; 7 scans for the larger and more complex room, the main salon).

The 3D models created as part of this project were exported and preserved in OBJ and PLY formats and shared with the Rambourg Foundation (see Figure 02). They will be used as visualisation and simulation tools to facilitate future planning of the physical restoration of the Palace and fundraising.

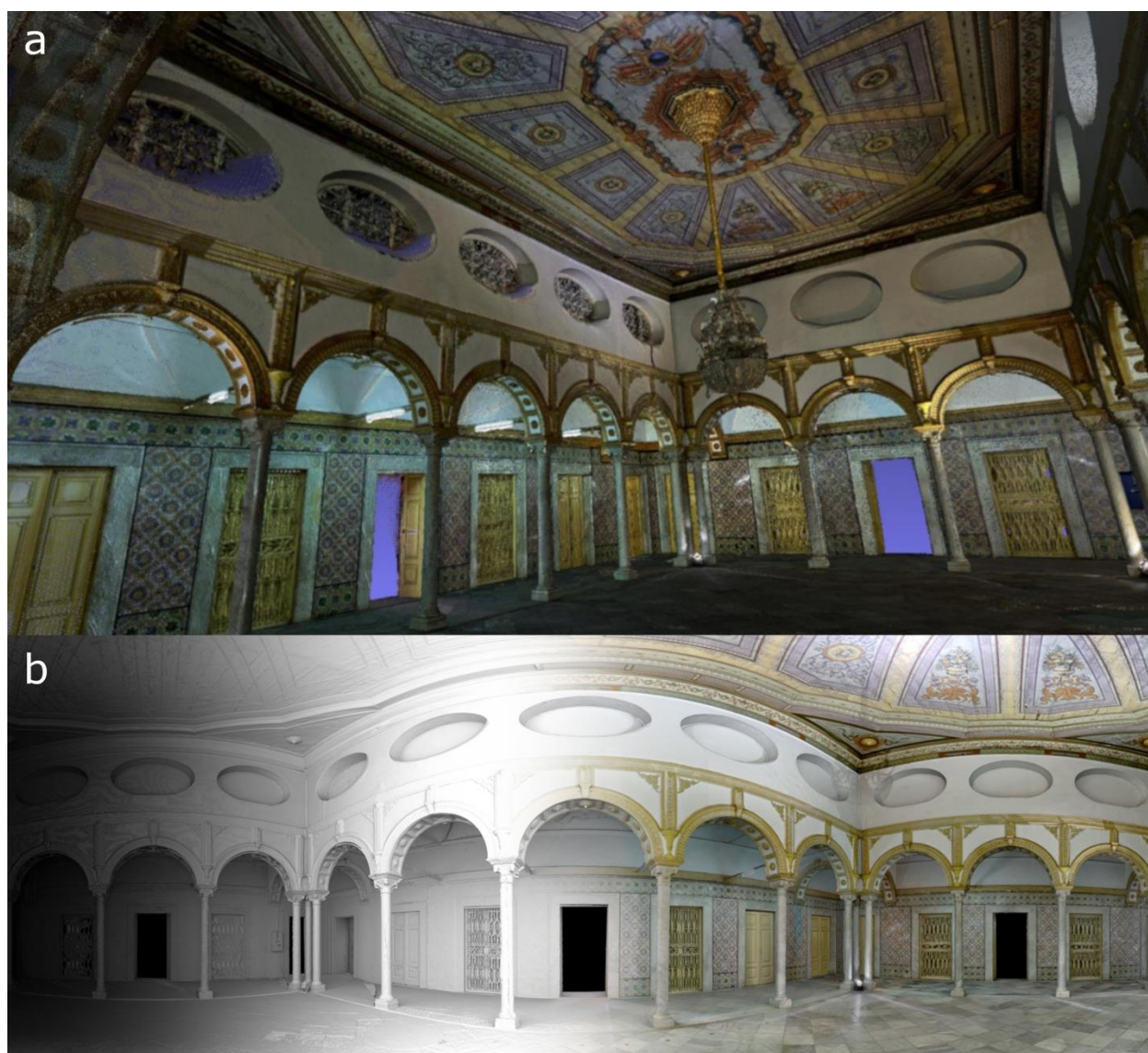


Figure 2. Laser scanning 3D model of the Ksar Said main salon: a. Point cloud 3D model; b. Textured 3D model.

3.2.2. Engage young Tunisians through digital technologies

Once we had completed the 3D scans, the next stage was to develop interactive models we could deliver online to as wide an audience as possible. We developed interactive 3D panoramas from the scan data. Considerations here were the availability across the country of high-speed broadband and the level of technology (high-end computers, mobile devices, etc) that were available to our audience. We also needed to consider the priorities of the project, which focused on the educational and advocacy aspects, rather than the 3D technology, per se. 360° panoramas are easily deliverable

over multiple platforms and are accessible to users with very slow broadband connections. While we recognise the strong educational potential of serious digital games [39, 40, 41, 42], we decided to adopt solutions that could minimise any requirement for familiarity with gaming technology, by providing a very simple to navigate interface that could enable children and teachers to focus on the educational activities designed in association with the platform. Also, as indicated above, we wanted to provide students with maximum autonomy to conduct inquiry, and by removing constraints which can be embedded in digital games, we expected them to be able to learn through open inquiry, rather than directed inquiry. This fits with the aspiration of the project, to enable individual young people to build their own understanding of Tunisian heritage.

To create the panoramas, we imported the 3D scans of the different rooms of the Palace in the 3D modelling software 3D Studio Max. After a preliminary stage of optimization of the models and the set-up of lighting and camera in the 3D environment for the final rendering, we exported several panoramas from the software (see Figure 03).

The final stage of the project was to integrate the panoramas in a web portal and associate them with educational activities based on inquiry. The contents were translated in Arabic, French, and English, to allow a wide international audience to know more about Tunisian cultural heritage through the exploration of the digital replica of the Palace.

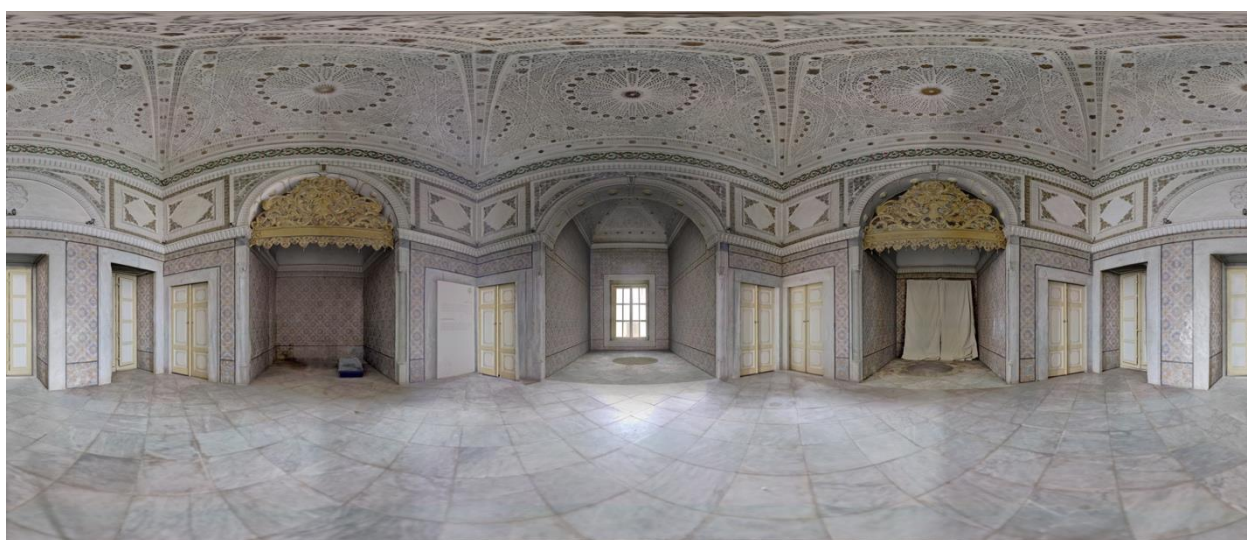


Figure 3. Ksar Said: 3D panorama of the Bey's room.

4. Design and Assessment: Methods

The panoramas were designed to provide portals to a range of specific educational 'missions'. These aimed to engage young people with the concept of 'hybridity' and the complexity of the history of their nation. The main idea is that students ask questions about their heritage, collect evidence needed to answer those questions by virtually touring Ksar Said, they interpret the evidence, and explain and communicate the meaning of the evidence. The design of each was focused around an 'inquiry question', and embeds one or more aspects of historical thinking (continuity and change; cause and consequence; historical thinking; use of primary sources; taking a historical perspective) [43]. Each mission has a specific 'content-knowledge' focus as well, with each focus chosen as one which can communicate the diverse historical influences on modern Tunisian society, namely: Architecture, Ceramics, Food, Language and the Beys. In such a way, the project delivered the educational and advocacy content to a wide audience across the country with limited and/or diverse methods of access to the Internet, this being the primary aim. Hence, the focus was not on simply reading factual information about history and culture, but the 'missions' required the audience to

look around the panoramas, moving from room to room, and to question preconceptions and to construct their own understanding and opinions from the evidence of different influences on Tunisian culture.

The idea was to present contents that appeared different from the children's everyday reality, which might seem foreign at first, and ask them to make connections between these apparent uncanny objects or concepts and their culture and everyday life. Such an approach has its foundations within inquiry learning, but also within the theory of the uncanny, taken from Freud [44] and conceptualised by James Auger: "any experience that challenges a preconception will at first appear odd, but here the details and finish of the artefacts, combined with the short explanations describing their functions and modes of interaction, entices the audience into exploring the concept further" [45] (p. 145). Such 'critical design' is used to explore alternative views of the world, to develop questions and to engage the audience in reflection [46]. The narrative approach embedded within the missions tried to foster curiosity and concern, and to avoid "visceral reactions of rejection" [46] (p. 79), something important when audiences' values and beliefs are strongly held. Hence, children should be able to explore this idea of hybridity and the concept of culture as *heterochrony* [47]: a series of layers, which add up. By beginning with the idea of the *uncanny*, inquiry approaches enable students to relate aspects of their daily life to the *uncanny* elements presented by some of the features of the Palace and elements of the educational missions.

Unfamiliarity is a useful starting point of such a learning experience, with the hybrid influences on Tunisian culture embodying aspects of such unfamiliarity. Anthony Dunne emphasises that "our ideas make their way into the material world in some way; it's not enough that they end up as pure thoughts. They must be embodied in object typologies that we understand: furniture, products, clothing, buildings, etc." [48]. Indeed, design of the missions drew on the following assertion:

"The designer has to create a 'perceptual bridge' to fill the gap between the viewer's present state of mind—technical knowledge, psychological perception and cultural background—and the foreign proposition. Drawing from the different texts, we can consider that the 'perceptual bridge' appellation includes:

- Using tangible artefacts, and a familiar typology of objects,
- Narration (rhythm, plot, style, etc.),
- Scales of complexity among a variety of media used,
- Aesthetic experience of encountering the artefact." [46] (p. 95).

We developed the missions as a co-design and assessment project based on: 1. Formative consultation with various stakeholders to build our understanding of Tunisian history and heritage, aimed at selecting the inquiry questions and related "missions" for the web portal; 2. A first stage of assessment with schools; 3. A summative assessment with one school and members of the INP, to assess content and infrastructure development and the quality and level of engagement of the proposed activities. As mentioned earlier, this project and the paper was conceived as a proof of concept. We wanted to explore how the combination of inquiry learning and VR could foster the critical engagement of young learners in Tunis with the complexity of their heritage. For the project, we were concerned with the whole process of content development, rather than the final outcome [49, 50, 51]. For this reason, we decided that a qualitative approach to our research was an optimal way to gather metacognitive and reflexive data for the critical design and implementation of the platform and associated educational contents. Engaging in a qualitative approach provides enhanced opportunity for detailed understanding of users' engagement and learning, allowing us to build understanding of the responses from 'ground-up', rather than superimposing our expectations through use of a survey. We achieved this through a thematic coding analysis approach [52] to understand and make sense of users' contributions. Engaging with fewer stakeholders to gain richer data is a common approach in educational research, and underpins the data collection and analysis processes here. Of course, the findings of this study could subsequently contribute to design of a survey to test the ideas presented below, and to assess specified learning outcomes, but that was not the immediate aim of the current study.

A total of 22 teachers and 30 school-children took part during the whole process.

1. The formative consultation aimed to define the inquiry questions and design of “missions”, included in-depth interviews and discussions with scholars of Tunisian history, members of the INP, members of the Bey family, and museum curators, especially curators of the recent exhibition *L'Eveil d'une Nation* [38]. This stage was aimed at bringing together stakeholders' understanding of Tunisian heritage, choosing the appropriate pedagogical strategies for the learning content, and identifying and building learning content from the starting points of local learners.

2. The first stage of assessment consisted of focus groups with teachers, head teachers and selected students of one state and two private schools, providing both primary and secondary education in Tunis. Focus groups are a recognized approach to qualitative data collection [52]. We organised a focus group with each school. The focus groups with the two private schools included teachers and headteachers only (four and fifteen respectively), while the head teacher of the state school decided that four selected students (age range 11-13) should participate in the focus group, which also included him and three teachers. Our concern before these focus groups was that inquiry activities would be too distinct from normal classroom activity, and that teachers would not see value in them, preferring instead to teach content, rather than let children build ideas in relation to their heritage. As such, we designed first drafts of five learning activities which drew on five concepts of historical thinking, and those aspects of cultural heritage outlined above (architecture, ceramics, food, language, Beys). We sought to establish the following:

- a. Subject knowledge of teachers and students about the five proposed themes (architecture, ceramics, food, language, Beys), and what support material teachers need to build their own knowledge?
- b. Pedagogical knowledge of teachers. We asked questions about how instructors teach history and how this might differ based on different schools (e.g. state-funded schools vs international schools). More specifically, we also focused on how Beylical history is taught in the classroom. To record possible dichotomy between didactic (being taught lists of dates and facts etc.) and inquiry (students engaging with ideas and building knowledge themselves with some scaffolding) approaches, we asked teachers the extent to which they engaged with key areas of historical thinking (establish *historical significance*; use *primary source evidence*; identify *continuity and change*; analyse *cause and consequence*; take *historical perspectives*).

We also focused more generally on whether aspects of inquiry were a common feature of lessons, asking teachers whether they ask students to do any of the following:

1. Ask questions
2. Collect evidence
3. Interpret and analyse evidence
4. Make conclusions

c. Finally, we talked through the first two mission activities with teachers and students and asked them to give honest opinions on how they would work, both for children at home and in class.

3. Our summative assessment was a final trial of activities in one of the three schools. We used three groups of four students to work through each of the activities, with an additional 14 students being shown the missions projected onto the whiteboard at the front of the class. A total of 26 students were involved (age range 11-13). Again, we interviewed each group of students at the end of each activity to understand their perceptions of the activity, how it engaged them and how it enabled them to learn.

5. Results

5.1. Design of main themes and activities and formative assessment of technologies

In developing learning content, we wanted different stakeholders to have an active role and, as such, we had to build in multiple review points. These stakeholders included historians, teachers, staff members of the INP, surviving members of the family of the Beys, and employees of the Rambourg Foundation, who had been involved with, and were building upon the legacy of, the exhibition *L'Eveil d'une Nation*. There were multiple opportunities to revise our approaches, to ensure that what we produced would be relevant. As explained earlier, our aim was to agree on five or six

379 broad themes that would become the main ‘missions’ of the virtual application. This stage of the
380 design was particularly complex, as the very nature of the online activities required us to reduce the
381 complexity of Tunisian history and heritage to a small selection of contents presented in a language
382 that would be engaging for young students. In our views, the missions would serve as a starting
383 point: for teachers, to engage in new, open, generative, teaching approaches; for students, to engage
384 with history and heritage in a way that might enhance interest in deepening their understanding of
385 the heritage of their nation. The preliminary stage of content-design required three trips to Tunisia,
386 aimed at visiting Tunis and its surroundings; scrutinizing the Said Palace, to detect and understand
387 the many influences embodied in its material features; and recording audio interviews with our
388 selected stakeholders (see above).

389 Our discussions with our selected parties confirmed that learning activities which involved
390 student inquiry were appropriate. It was clear from the interviews that they felt students were taught
391 well in schools, but that greater questioning and learning autonomy would be of benefit. We decided
392 to frame the learning activities around broad concepts of inquiry.

393 During our interviews, we observed that different parties had different views about the key
394 aspects of heritage to explore. Some parties were reticent about activities focused on the role of
395 women, on the post-Arab spring era, and on the era of Bourguiba. After consultation with some of
396 our Tunisian collaborators, we decided to avoid engaging with more recent history, including the
397 post-Bey era of Bourguiba and the Arab Spring; it was not our intention to make a direct political
398 contribution to current public discourse in Tunisia. We felt that our knowledge of, and ability to build
399 learning around, less recent historical periods may be more successful, and not attract controversy.
400 It was our aim to enable children to think, without having such thinking masked by strongly-held
401 beliefs. As such, we opted to focus on five “missions” and their related activities: Food; Language;
402 Architecture; Beylical history; Ceramics (see Figure 04).

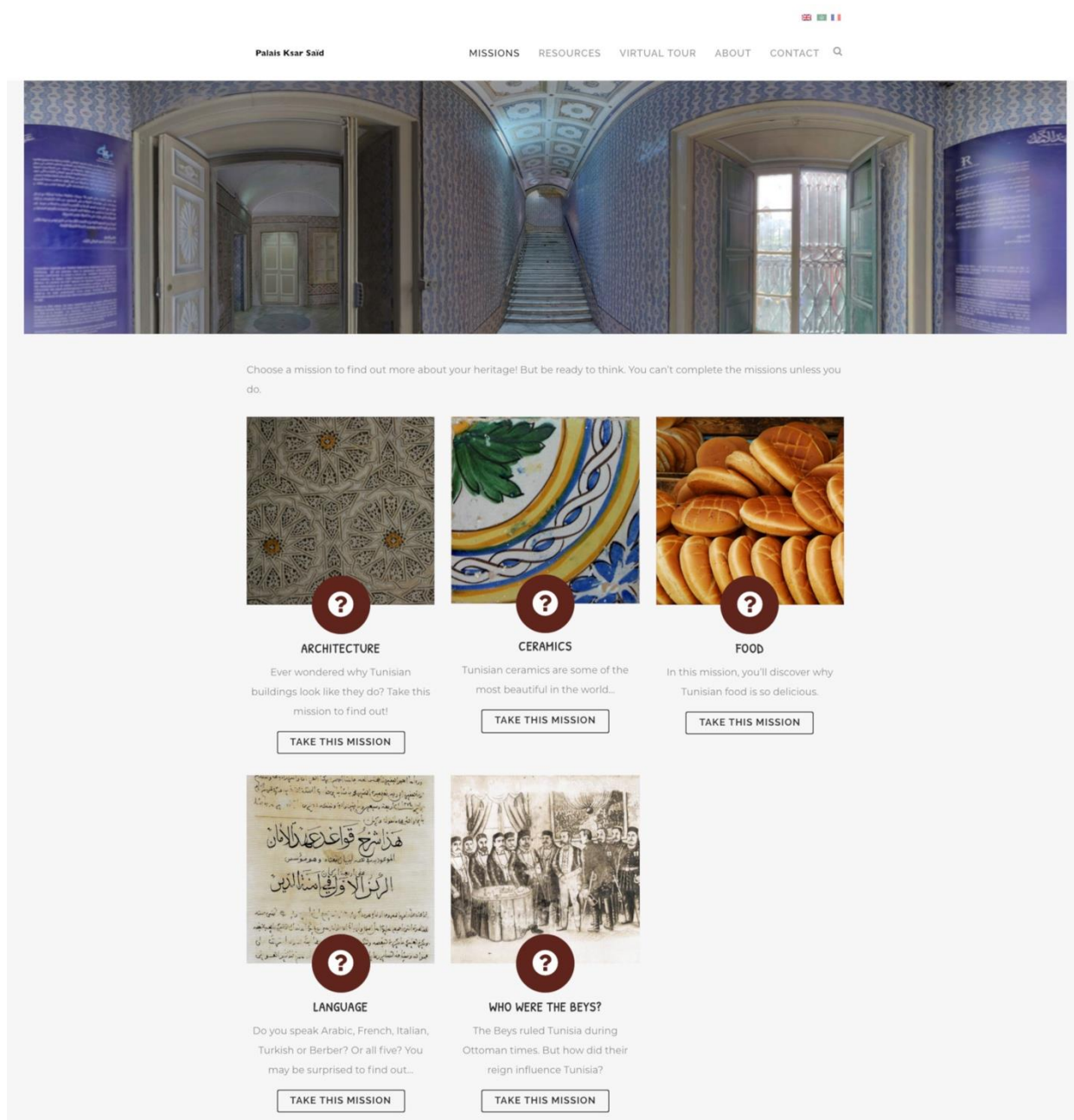


Figure 4. Missions and their related activities: Food; Language; Architecture; Beylical history; Ceramics.

Food: this was the first theme selected for the 'missions'. All parties agreed that it could be immediate and easy for children to relate to food as a form of cultural identity. Food is a form of heritage that transcends cultural and religious barriers [53, 54], and Tunisia is filled with restaurants that reflect the movement of people in the country throughout history. We thought this could be the easiest mission to make students think about *hybridity* and *heterochrony*. Such a judgement was reinforced from a professional standpoint (by the teachers), from an academic standpoint (by a history academic) and by children themselves.

Language: this provided another immediate theme to introduce the concept of hybridity. Listening to foreign sounds that are familiar, students can create easy connection between their language and foreign languages that might have influenced the formation of some of the Tunisian words in the past. This 'mission' also represented an occasion to introduce the concept of *Lingua Franca*, a mix of Ottoman, French, Spanish, and Italian, which spread in the Mediterranean starting from the XVI cent [55]. Tunisian Arabic has a lot of borrowed and adapted words from the languages

419 of the Mediterranean, and hence itself has some characteristics of a *Lingua Franca*. This idea originated
420 with the Tunisian history academic, and its potential utility was reinforced by our own etymological
421 research.

422 Architecture: this theme was aimed at inviting the students to explore the Palace and its
423 architectural features and think about the various intangible cultural aspects that might have
424 influenced the construction of this building. Members of the INP confirmed that recognition of
425 features within the Palace had the potential to both raise awareness of different cultural influences,
426 but also to make sense of architectural features outside of the Palace, enabling their everyday built
427 environment to reinforce their learning from within the virtual model of the Palace.

428 Beylical history: this was the most historical theme overall and the one in which students could
429 engage with original documents which formed that basis of their modern nation. The Beys were the
430 owners of the Palace, ruled Tunisia from 1705 and had a significant role in the formation of modern
431 Tunisia [56]. Nonetheless, many Tunisians do not know much about them and we agreed with our
432 parties that it would be important to challenge young Tunisians with this period of Tunisian history
433 through historical inquiry. A member of the Bey family was keen for an accurate story to be
434 communicated to young people, and the Rambourg Foundation had already asserted its importance
435 by including Beylical history within *L'Eveil d'une Nation*.

436 Ceramics: Tunisia has some of the most beautiful ceramics in the world and had been renowned
437 historically for its production of ceramics. The INP and the history academic recommended ceramics
438 as being a topic area which is strongly related to Tunisian identity. Ksar Said contains a rich variety
439 of tiles that decorate each corner of the building. Some clearly represent Tunisian culture, some others
440 show clear influences from other European ceramics schools. The number and variety of tiles in the
441 Palace and their differing styles gave a wide variety of evidence upon which to build inquiry activities
442 (see Figure 05).

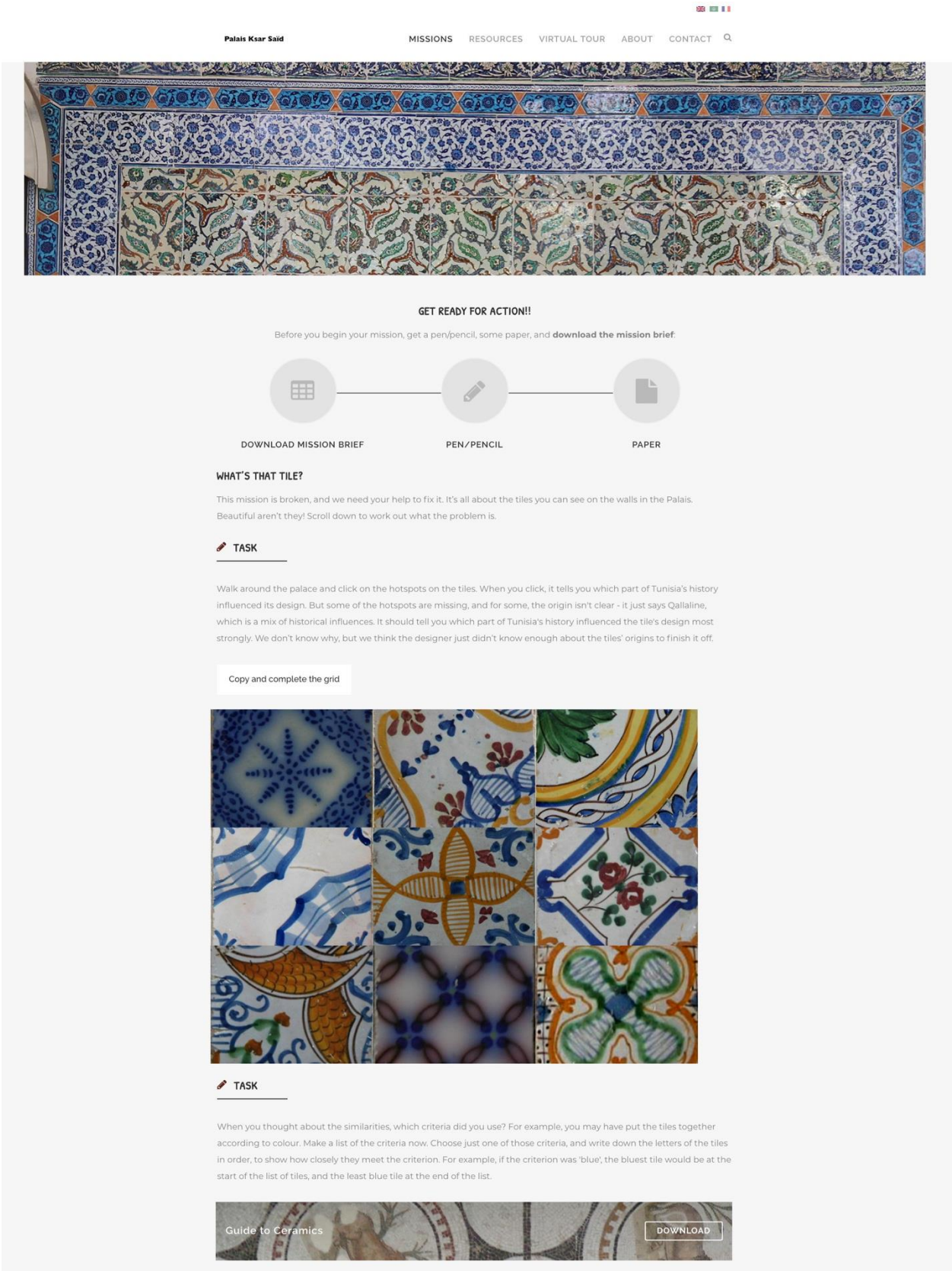


Figure 5. Missions: Ceramics.

Regarding infrastructure development, we came to understand that Tunisian schools, especially state schools, are not well provided with up to date computers, and that many children would engage

with the Palace via mobile phone. Hence, as indicated earlier, we opted for panoramas within the scanned model, to ensure low bandwidth, whilst still allowing us to build in virtual content.

5.2. First stage of assessment with schools

Our concern before the focus groups was that inquiry activities would be too distinct from normal classroom activity, and that teachers would not see value in them, preferring instead to teach content, rather than let children build ideas in relation to their heritage. As such, we designed first drafts of five learning activities which drew on five concepts of historical thinking, and those aspects of cultural heritage outlined above. During the focus groups, teachers and students could interact with the 3D panoramas while discussing contents with us. One student highlighted the importance of the panoramas for the interaction with Ksar Said. He said: "During our visit [to Ksar Said for *L'Eveil d'une Nation*] they said we could not take photos, so we could easily forget the details of the Palace. With this we can revisit the details of the Palace" (Emphasis on the original talk in English).

Feedback on the activities was also very positive. We understood that teachers' knowledge of their own heritage was in some places limited, and that pedagogical understanding differed very much between schools, with the international schools having a more ingrained tradition of involving students in their own learning. All teachers, particularly the head teacher from the state school were very positive about the role of such activities in enabling students to learn, and in providing a new approach to learning. The approach to learning through inquiry was one which they all valued but may not have found easy to implement. Particularly, state schools struggle to introduce new methods, due to time and programme constraints. When we asked the head teacher of the selected state school how the Beylical period is taught, he replied:

"We have a theoretical answer and practical answer. Which answer would you like?...OK, here the practical answer. We have 50 minutes to teach the period from the *Beylical to the 19th century: crisis and attempts of reform*...50 minutes in which we also have to take attendance. We start the lesson with an introduction, then give a list of facts and ask them to take notes. This is what we do...Last year for the first time we had this experience...we brought the students to the exhibition [*L'Eveil d'une Nation*] and they saw something they will never forget..." (English translation from the original talk in French). The latter statement suggests a positive attitude towards experiential learning and students' engagement with material remnants of the past.

While it is difficult for state schools to experiment with novel pedagogical approaches in the classroom, they can organise after-school teaching clubs and would welcome engaging material, such as the virtual experience of Ksar Said, to critically engage students with history and heritage. The head teacher also suggested that his students have little opportunities to visit the heritage sites, making virtual tours particularly important for them: "This is a school with students coming from suburban areas of the city. This does not mean that they are not clever, it means that they have less opportunities...we do not have the money to bring them to visit monuments and sites, which means that these virtual tours have an added value for our students. They allow them to visit monuments that they would not visit otherwise" (English translation from the original talk in French). (see Figure 06).



Figure 6. Assessment with schools. Talking about pedagogy.

This first stage of assessment allowed us to refine our support materials based on the feedback received. We decided to include briefs on the historical concepts in the webpage, as professional development materials, and we removed the information briefings to avoid teachers simply teaching content. We finalised content of all activities and resources and then returned to Tunisia to conduct user trials (i.e., summative assessment).

5.3. Summative assessment

During our summative assessment with students, we found that activities which required them to hunt the virtual Palace for evidence were most popular and engaging, and the benefits of setting the learning activities within the virtual model were clear in fostering the engagement of students. Because we had opted for panoramas (for technical reasons outlined above) there was a limit to the sophistication of such activities, which might be overcome in similar future projects by experimenting the same activities in immersive gaming platforms. We also tried priming students with knowledge before they engaged in the activities. This undermined the activities in the students' eyes, and this vindicated our decision to remove information briefing documents from the website. This meant that all learning and information could only be acquired by engagement with the learning activities. There is ample evidence around the world that teachers can tend to focus more on content than on skills, particularly in response to high-stakes testing (reviewed in [57]). However, encouraging students to think is important to their learning; they cannot simply be considered to be 'empty vessels' into which information and ideas can be 'poured' [58]. Finally, we found that some of the evidence hotspots were located wrongly or needed text refining. We even found that treaty documents we had thought were Arabic (and which we had asked students to examine as part of an activity) were in fact in Ottoman Turkish. We then had to retranslate them to enable students to work with them effectively. We asked a number of summary questions, both to understand students' perceptions of the activities, but also to understand the extent of their learning. We were unable always to audio-record and transcribe students' contributions directly because of the amount of noise in the class; hence, we took 'field notes', from which we drew the following themes:

1. Engagement: they liked "having to answer questions" and "looking around the Palace" for that evidence.

2. Challenge: they found it surprising that there was not necessarily a right answer to some of the questions, but the teacher thought they “understood they were working more like real historians” and heritage specialists in the tasks provided.
3. Engagement with historical thinking: One group commented that it was “good seeing the old Treaties and old photographs”, and that they were surprised by continuity in foods eaten in Tunisia.
4. Surprise: Students were surprised by the impact of other languages on Tunisian Arabic, displaying evidence that their preconceptions about their language had been effectively challenged. This was visible in their facial expressions as we circulated around the class, but also in the comments they made: “it’s the same in Italian!”. It appeared the language activity was a helpful instrument to evaluate the idea of the *uncanny* (see above).
5. Relevance of outcome: Students’ engagement in the ceramics activity was perhaps less pronounced than in the language activity. The focus of this activity was to foster pattern recognition in students, whilst engaging with historical designs, fostering critical thinking. Although it was impossible to change further, a game-based outcome in a games engine may have been a better vehicle for this task.
6. Knowledge building: All students and their teacher reported that the activities enabled them to critically reflect on their cultural heritage. This may have been almost a ‘default’ outcome, given the design of the missions. We observed instances of dialogue, and of multiple students contributing to that dialogue, questioning themselves and each other (see Figure 07).



Figure 7. Summative assessment of the 3D platform and activities with students.

In discussion with the teacher, he stressed the key importance of this kind of website. He reported on behalf of colleagues that their knowledge of Tunisian cultural heritage is limited, and having support sites like this, with which students can engage directly (through French or Arabic) was essential to enable students to explore their own conceptions of Tunisian culture. The teacher thought the areas were well chosen. He asked the students about their enjoyment of the activities, to which they replied very positively. His review of the professional development materials (regarding historical concepts) was also very positive. He thought these were “clear and provided a new way of thinking about history teaching”, which he appreciated, and could see embedded in the online activities.

6. Discussion and Conclusions

We present in this paper the results of the design and implementation of the *Digital Documentation of Ksar Said* project, aimed at combining inquiry learning methods and VR to enhance critical young people’s critical engagement with heritage in conflict affected countries. The missions aimed to engage young people with the concept of ‘hybridity’ and the complexity of the history of

their nation and were built and designed based on inquiry learning and the theory of the uncanny, a critical design theory used to explore alternative views of the world, to develop questions and engage the audience in critical reflections.

The selection of effective technologies, and the design of the online platform and its associated contents was a complex, non-linear process. It required formal and informal meetings, focus groups, and interviews with various stakeholders, as well as an important process of mediation between the different stakeholders involved in the co-creation of contents. While the selection of final contents and activities for the platform required us to reduce the complexity of intangible aspects of Tunisian heritage into a small number of 'themes', preliminary assessment of the activities suggests that the learning method proposed is an effective way to actively engage young Tunisian students with the concepts of *hybridity* and *complexity* and leaves an open space for teacher-student discussions around constantly changing heritage-values.

Students valued and worked well within the educational activities produced. Evaluation data suggested that they had learnt ideas about their heritage, and that the most effective approach was to ask them to inquire to help them to think, rather than simply teaching them information. Some final evaluation feedback led to final refinements which have now been made.

Inquiry activity design benefited from use of historical thinking as a frame. Evaluation data made particular mention of the concepts of primary sources and continuity and change. By using a well-evidenced framework to foster learning, we gained evidence that historical thinking can help students build heritage ideas. A two-stage evaluation was important, evaluating at stage one with multiple schools (in November 2017) and then evaluating pre-final versions (in January 2018) in more depth enabled us to ratify our learning strategy and then refine the activities themselves.

Our final evaluation resulted in considerations and learning to take forward for future projects that will deepen our understanding of how the combination of inquiry methods and online VR heritage platform can foster critical thinking of history and heritage in conflict affected countries. The first consideration is related to historical and heritage contents: we did find it difficult to learn ourselves about Tunisian culture. When the Institute for National Heritage reviewed our information briefing documents about the themes, they found a number of errors, which also prompted us to remove them from the site (along with our inclination to avoid teachers simply teaching content, as explained above). With regard to the summative assessment, in future projects we would trial activities first with teachers, to iron out difficulties, before taking them to trial with students. Professional development materials were well evaluated because they serviced a desire amongst teachers to learn about modern pedagogies.

While our current work uncovers some first observations in this area, there is plenty of further development worth exploring. It would be valuable in future to try to set learning activities more fully within the virtual Palace by use of a game engines, to see if the use of immersive VR environments might enhance student engagement and motivation. It would also be critical to continue to involve students in the co-creation of contents for the virtual platform. To this purpose, our future research will aim to expand this study by developing a more structured programme with schools in Tunisia, aimed at testing similar activities using different technologies, to see which technology might better enhance the learning experience. In future projects, we will also aim to expand our study to other conflict-affected regions of the Mediterranean.

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