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Practice case study

## Exploring where science is made in an outdoor and digital museum in a Brazilian university

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## Abstract

In conventional science museums, where collections are at the centre of activities, large financial contributions and staff are required, which results in their existence being unfeasible in many cases, especially in developing countries. We present an alternative proposal: a science centre called Knowledge Paths, which is, simultaneously, a virtual platform and an outdoor museum located on one of the campuses of the Federal University of São Carlos (UFSCar), Brazil. The project has a much lower cost than traditional institutions and presents itself as a possibility for mediation between different audiences and scientific knowledge. The approach used is supported by the theoretical framework from Educating Cities and science, technology, society (STS) education. The project proposes itineraries to be followed on campus, through signposts that, in addition to texts about great scientists and other thinkers, contain QR codes linking them to videos, other texts and supplementary materials related to the areas of knowledge associated with the marked places. The project also offers guided tours in which participants visit laboratories and other locations where science is made. The museum has two functioning itineraries: the Epistemological Trail, about history and the main characteristics of different areas of knowledge; and the Light Trail, which is aimed at children.

**Keywords** science museums; outdoor museum; virtual museum; knowledge dissemination; popularisation of science; STS education; Educating Cities; science education; public communication of science and technology; science engagement

### Key messages

- Science museums and science centres play an important role in bringing the public closer to scientific knowledge; however, the centrality of collections and high maintenance costs make their existence in higher numbers unfeasible, especially in developing countries.
- The Knowledge Paths project is an outdoor and, simultaneously, virtual museum designed within the framework of science, technology, society (STS) education and Educating Cities which uses the physical spaces and dynamics of one of the campuses of a Brazilian university to bring the public closer to knowledge, directly where it is produced.
- The approach used in the project is an alternative to traditional science museums and science centres, due to its low cost of implementation and operation, flexibility and possibility of multidimensional experiences related to knowledge production, especially considering relations between science, technology and society.

## Introduction

Science museums and science centres have historically played an important role as spaces for non-formal education, as pointed out by Jacobucci (2008). Such practices are growing in relevance, standing out, as defended by Gohn (1999), for their potential in educating for citizenship, especially regarding subjective formation, the construction of identities, the development of the sense of belonging, and the cultural and political formation of citizens.

For Cascais and Terán (2011), such spaces are successfully used in non-formal science practices because they offer a more pleasurable learning experience, facilitating the apprehension of content from the formal curriculum, as they allow new and distinguished possibilities for reading the world, not restricted to institutionalised and merely instrumental knowledge (Trilla, 1996). However, these characteristics favour the establishment of a framework in which science and natural history museums, science centres, and zoological and botanical gardens increasingly assume a pedagogical bias, being considered as an extension of formal educational practices, that is, of school itself. This aspect has been a reason for concern, and for warnings about a total schooling of such spaces (Queiroz et al., 2002; Vieira, 2005), which would cause them to lose their characteristic of favouring new readings, and would reduce them to reproducers of formal educational content.

Another aspect of traditional science centres and museums to be observed with a critical view is the central role in the educational process that is attributed to phenomena and objects (Wagensberg, 2005). Such centrality is justified when these phenomena or objects have unique characteristics, or when they are not easily accessible. However, most of these phenomena and objects do not present such singularities and, thus, are only displaced from their place of origin (Fabrício et al., 2013), offering an average experience, and constituting, as Adorno (2010) calls it, an experience of semi-formation.

Science centres and museums have a key role in reconciling the public with the areas of science, technology and innovation (Massarani, 2020). However, the large amount of money needed to build spaces for these institutions, and for the hiring and training of staff, brings the necessity of developing innovative proposals that allow the implementation of new projects, at low cost, aimed at scientific knowledge dissemination and science education, in order to consolidate the so-called scientific culture. According

to Godin and Gingras (2000: 44, our translation), this culture can be understood, despite a diversity of possible definitions, as the 'expression of all the ways in which individuals and society appropriate Science and Technology'. Godin and Gingras (2000) point out, however, that the scientific culture encompasses individual and social dimensions, highlighting that the concept is necessarily multidimensional, and, instead of opposing science and culture, assumes from the beginning that science is a part of culture.

It is precisely from such needs and thoughts that the Knowledge Paths (*Caminhos do Conhecimento*, in Portuguese, its original language) project takes shape, as an outdoor and, simultaneously, virtual museum, developed by the Open Laboratory of Interactivity for the Dissemination of Scientific and Technological Knowledge of the Federal University of São Carlos (LAbI – UFSCar).

This paper presents the theoretical framework of the project: Educating Cities and science, technology, society (STS) education, focusing on the educational potential of physical spaces – especially those that enable deeper understandings, reflections and experiences of the complex interrelationships between science, technology, society and environment, and their social representations. It also shares first impressions from its establishment, testing phase and experimental operation.

## Theoretical framework

Specialised knowledge and technical and technological development have been central to the history of humanity since its very beginnings. However, the Industrial Revolution saw the emergence of a new and prominent role for science and technology, which was accentuated throughout the twentieth century, propagating a mechanistic rationality that imposed, from the inauguration of modernity, a fragmented world vision. Such a paradigm of thought attributed to reason the same value that was once attributed to myth (Adorno and Horkheimer, 2006), with science and technology being the occupants of 'Olympus', from where they would be able to save men with their 'magical powers'. However, the promised salvation did not come. On the contrary, scientific advances were manifested in war machinery, in more efficient forms of capital accumulation and in the alteration of labour and social relations. The technology that, in Brecht's Galilean dreams, would free the people from arduous hours of work became an instrument of control and domination, as presented by Marcuse (1999). Despite the contradictions of such a model, after the Second World War, there was a short period of economic euphoria, provided by the rearrangement of capitalist forces (Hobsbawm, 2009). Capitalism, however, was also beginning to reveal its own contradictions as it exposed problems related to environmental degradation, increased the disparity between the countries of the North and the South, and spread armed conflicts across several regions of the world.

As a means of resistance to such logic, from the 1960s and 1970s onwards, the STS movement began, seeking in-depth thoughts on the social impacts of scientific and technological development (Auler and Bazzo, 2001; Santos and Mortimer, 2001). The inclusion of the STS approach in science education – whether in the formal or non-formal sphere – aims to educate citizens for participation in techno-scientific matters. In order to achieve this goal, this approach must break with the dichotomy between STEM (science, technology, engineering and mathematics) and the arts and humanities (Santos, 2005), the maintenance of which contributes greatly to the situation where decisions continue to be taken by only a few groups, while the majority of the population is prevented from any effective participation. Arroyo (1998) understands that educational processes based on this dichotomy offer only the technical knowledge necessary to produce labour that guarantees the maintenance of existing power structures, that is, a merely instrumental training.

Activities in the STS perspective can be conducted with cities as an integrative space for learning, because by allowing knowledge about identities and the territories in which the subjects work, they increase the possibility that from the conjunction of different knowledge fields emerges a dialogue between scientific information and educational training. However, for this to happen, it is necessary that this environment goes through a stage of mapping its potential (Santos et al., 2009). Brandão (2008) also recognises the importance of this kind of strategy because, in his interpretation, education for citizenship

is materialised in reflections, articulations and conflicts that occur at the local level, so knowing and reflecting on the territory intensifies the flow of knowledge, and the interaction between different kinds of knowledge.

In Ancient Greece, city and education were inextricably linked. Socrates believed that knowledge could only take place in the dialogue provided by the polis (city), and the polis, conversely, owed its existence to such a process of transmission and accumulation of knowledge. Education was, therefore, considered as the function of the city, making it impossible to separate polis and paideia (education) (Gómez-Granell and Vila, 2001). Concerning museums, the modern concept is very different from the origin of such spaces, which emerged in the fifteenth and sixteenth centuries from collections and the so-called 'curiosity cabinets', workspaces for scientists and artists which, at the same time, housed apprentices and opened themselves to the visitation of patronage. Such spaces, however, were subjected to an epistemological change characterised by a split between the arts and sciences (Janeira, 2005). In this process, many science museums ended up perpetuating the fragmentation of knowledge and, often, reproducing the hegemony of scientific and technological knowledge over other kinds of knowledge. There are growing efforts aiming to reconnect science and these other realms of the human experience, within these institutions and beyond, among which we include the Knowledge Paths project.

Another aspect that differentiates spaces such as cities (and campuses) – which we characterise as real-life territories – from more schooled or fragmented spaces concerns what Morin (2001) calls 'relevant knowledge', that is, knowledge which allows a contextualised and multidimensional understanding, as opposed to the mere accumulation of information.

In this sense, STS approaches are essential to citizenship education because, in addition to encouraging participation and decision making, they allow for the unveiling of the intrinsic relationships between techno-scientific development and society (Auler and Bazzo, 2001; Santos and Mortimer, 2001; Auler, 2007).

As Freitas (2008) reminds us, even though scientific and technological issues are present in our daily lives, people often do not understand the real dimension of their impacts, because the interrelationships between science, technology and society are not often addressed in teaching situations. This condition reinforces the need for a mobilisation in the sense of 'contributing to the formation of people capable of giving opinions about the destinies of Science and Technology, which requires, on the part of educators, an emphasis on the understanding of Science, of its achievements and limitations' (Freitas, 2008: 229, our translation).

The Educating Cities perspective allows for active citizenship by presenting students with issues that arise from the city itself, whether through its educational means, its rich learning contexts, or through the dialogue and confrontation of knowledge typical to city life (Alderoqui, 2002, 2003; Gadotti et al., 2004; Trilla, 2005a, 2005b).

We consider such an approach essential in view of the growing importance of urban issues, intensified by rapid population growth and the rise of neoliberal logic in contemporary society, which, as Harvey (2013) states, contributes to the emergence of demands related to the guarantee of full citizenship: public safety, urban mobility, appropriation and enjoyment of public spaces, the right to housing, and environmental issues, among others. Although some of these demands are presented as common, many others are not shared, due to growing inequality. Thus, cities and their demands – in the same way as happens with areas of knowledge – are sometimes fragmented, preventing a broader understanding of such phenomena which is necessary for the political action characteristic of democratic societies.

In addition, as Carrano (2003: 20, our translation) reflects, we live in a moment in which educational processes and access to knowledge can no longer materialise only in the restriction imposed by school and, therefore, 'it becomes of vital and strategic interest that the educational field expands its reflections on the wide range of educational possibilities that open up in the multiple contexts, real and virtual, of the city'.

Beyond the walls of institutions, a myriad of knowledge is produced and shared, not only by specialists – scientists, technicians and teachers – but also by other people who, in their daily relationship

with the world, and especially with others, also learn and teach. In this sense, non-formal education practices can, especially in articulation within the school, allow the dawn of a new perspective on learning and teaching. However, for this new education to take shape, it is necessary to go beyond the discursive sphere, adopting and experiencing the practice of concretely emancipatory and progressive educational perspectives, such as those highlighted by STS education and Educating Cities (Fabrício and Freitas, 2017).

## Development

As already discussed, Knowledge Paths was built within the framework of Educating Cities and STS education, since we understand that articulating these perspectives enables a rupture of the 'walls' – both physical and symbolic – that limit the spaces of knowledge production and dissemination institutions. These walls exist not only because of individual characteristics, such as the absence of what Chassot (2010) calls a minimal scientific literacy, but also and mostly due to structural and systemic obstacles, such as the absence of public policies aimed at stimulating the STS approach, the lack of accessibility, and socio-economic conditions that hinder the opportunity to visit these institutions.

Our efforts were aimed at the development of a platform to facilitate the processes of knowledge diffusion, starting from spaces of collective, daily life and of meeting and sharing with others, because we believe that this perspective can provide unique opportunities for reflection in the face of the challenges imposed by today's society. We believe this because the construction of our biographies directly depends on the social articulations we establish in different contexts, allowing us to appropriate, from our experience, meanings about the world in which we live.

As Bondía (2002: 27, our translation) reminds us, what we understand as experience is an individual and relative knowledge, which carries our subjectivity, since 'If experience is not what happens, but what happens to us, two people, even if they face the same event, do not have the same experience. The event is common, but the experience is for everyone their own, unique, and somehow impossible to repeat.' Such a perspective is close to that of a reader, who, in surrendering to reading, finds a multiplicity of meanings, opening up new dimensions where supposedly only uniformity is offered (Forster, 2012).

Considering such thoughts, the project turned to the development of an alternative to traditional science museums and centres to be implemented on one of the campuses of the Federal University of São Carlos, located in the city of São Carlos, in the state of São Paulo, Brazil, in a first experimental stage, and later to be adopted also on the other three campuses of the institution, in the cities of Araras, Sorocaba and Buri, all in the same Brazilian state. Therefore, it started from three central points: (1) mapping and definition of visitation itineraries; (2) design and development of the platform; and (3) development of specific content for each itinerary.

## Results

Beyond the academic community, and others related to educational and scientific practices performed by this community, the São Carlos Campus of UFSCar is visited daily by a large number of people who participate in sports and leisure activities in its facilities and green areas. Although the university has a strong presence of local themes in its research efforts, and is recognised for its transformative role, not only in the broad sense of its contributions to science and education, but also within the territories that host the institution, many of these visitors are unaware of these activities. The main goal of the Knowledge Paths project is to promote new ways of understanding the role of the institution in the production of knowledge, and the importance of this knowledge for society, focused on this very diverse public (in terms of age, educational level and other sociodemographic characteristics) that already visit the campus. It does this through contents, processes and interactions that highlight the historical and social roles of the various fields of knowledge, share the practices and processes of the university's scientists, facilitate



dialogue between different kinds of knowledge, and enhance the sense of belonging awakened by this insertion in the various spaces of the campus.

The definition of the itineraries sought to establish the points of interest for the dissemination actions, based on the specificities of the areas of knowledge and, at the same time, taking into account the physical aspects of the campus spaces, as well as the daily dynamics of its regular visitors. The campus was mapped using digital cartography tools and, thereafter, with visits to the various spaces and routes of interest. As we have already pointed out, Santos et al. (2009: 107, our translation) insist on the importance of this type of approach: 'In order to promote the critical formation of social subjects to their citizen rights of not merely knowing the sciences, but associating them with the cultural field, a cartographic mapping is always the primary goal.'

Based on the results of the mapping, 17 places of interest were established for the implementation of the first stage of the project. These points are linked to spaces that refer to subjects such as philosophy, engineering, biological sciences, chemistry, computing and health sciences, among other areas of knowledge. From the definition of these landmarks, it was possible to set up a circular itinerary through the campus, observing the priority routes for the movement of pedestrians.

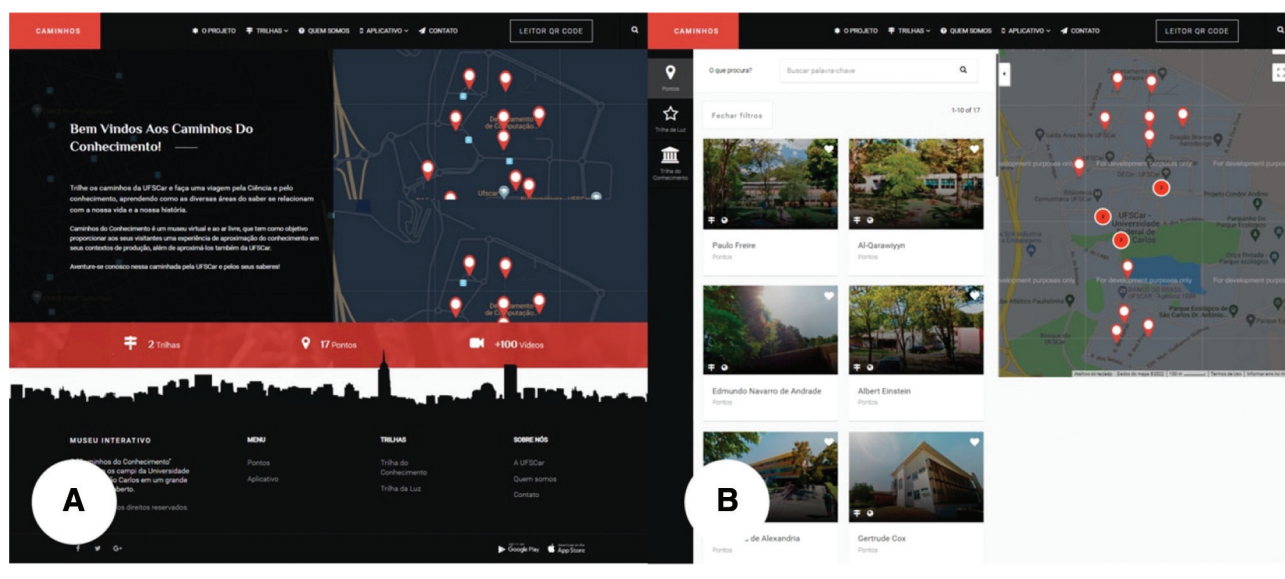
The points of interest were identified as: Bento Prado Júnior – philosophy; Ramon Margalef – limnology; Marie Curie – chemistry; Charles Darwin – biological sciences; Leonardo da Vinci – engineering; Ernst Ruska – microscopy; Galileo Galilei – astronomy; Alan Turing – mathematics and computing; Carlos Chagas – medicine; Ana Néri – health sciences; Leon Battista Alberti – interdisciplinarity; Gertrude Cox – statistics; Alexandria Library – access to knowledge; Albert Einstein – physics; Edmundo Navarro de Andrade – ecology and conservation; Al-Qarawiyn – university; and Paulo Freire – education. Each one of these has a physical sign (a totem), as shown in Figure 1, illustrating the Galileo Galilei point.

The physical signs present the names of the points and informative text about the related area of knowledge, allowing a contextualised contact for visitors and pedestrians who circulate on the campus with the scientific knowledge produced in those places. In addition, the totems contain QR codes (graphic codes that point to websites) that allow access to the museum's virtual support through mobile devices such as mobile phones and tablets. The virtual platform is designed for use on mobile devices and on the web (Figure 2A), providing an intuitive interface that presents content associated to each point of

**Figure 1. Point Galileo Galilei, located near the Astronomical Observatory of the Federal University of São Carlos, Campus São Carlos, São Paulo, Brazil (Source: Authors, 2022)**



Figure 2. (A) Web platform home page ([www.caminhos.ufscar.br](http://www.caminhos.ufscar.br)); (B) Map indicating the location of points and paths through the university campus (Source: Authors, 2022)



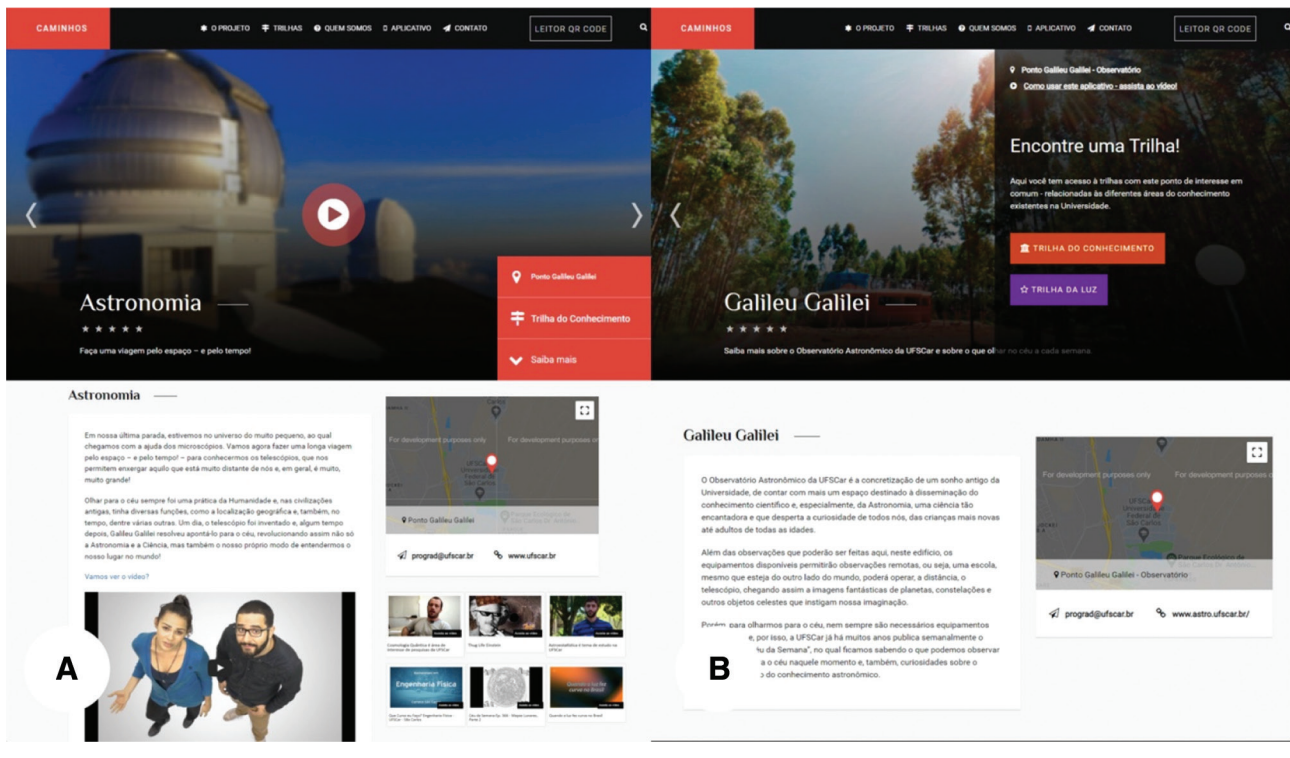
the itinerary. In the web version ([www.caminhos.ufscar.br](http://www.caminhos.ufscar.br)), users can remotely travel the entire itinerary (Figure 2B), accessing the contents of each point. In the version for mobile devices – launched from the first access to any of the QR codes (and available in iOS and Android) – users can only access the content of each point when they read the code with their device. This strategy was used in order to encourage circulation through the campus, bringing the virtual experience closer to the concrete everyday experience of these spaces of knowledge production.

In addition to accessing the museum's virtual content using mobile devices, visitors can access the university's laboratories and chat directly with some of its researchers. This access to the laboratories is only offered on guided tours, for individuals or groups, scheduled in advance with the project monitors. Visits without the assistance of monitors are free and can be carried out at any time on the university campus.

The production of specific content was inspired by the itineraries in order to allow the emergence and construction of narratives about areas and knowledge linked to each of the marked spaces, and establishing among them what we call 'trails'. A point in a trail keeps its specificities even when shared by two different trails. In other words, after opting for a trail, whenever the user enables a new point – whether on the web or the mobile version – the access is to a welcome video related directly to the trail that is being followed at the time (Figure 3A).

After accessing the video, visitors can choose to move on to the next point on the trail or to access written materials (Figure 3B) related to the topic discussed in that specific point of the trail, which deepen the theme presented in the video, as well as an extensive list of supplementary materials, such as other texts and videos, produced by the project itself or by partners. A video about the operation of the project can be accessed at [www.labi.ufscar.br/2017/07/01/caminhos/](http://www.labi.ufscar.br/2017/07/01/caminhos/). The first itinerary, called the Epistemological Trail, operating in a beta version, passes through all the points of the project, narrating the history of the areas of knowledge established at the university. The videos in the series that bear the project name Knowledge Paths, and comprise this first trail, present key issues in each of these areas, with presenters recorded in studio and outdoors, in the surroundings of each of the points of the project, as well as animations and interviews with researchers from the university.

Figure 3. (A) Page with direct access to the specific video of the point of the trail chosen by the visitor (example: <https://youtu.be/CZ4GPwo91os>); (B) Page with text content and links to access additional content about the chosen point (example: <https://www.caminhos.ufscar.br/places/ponto-galileu-galilei/>) (Source: Authors, 2022)



The strategy used in the video scripts rests on the premise of reinforcing the interactions between science, technology and society, considering three central dimensions of science education, *knowing science*, *knowing about science* and *knowing how to do science* (Cachapuz et al., 2004), which are necessary for reading and understanding the world. *Knowing science* refers to the concepts, definitions, laws and theories resulting from scientific production. The *knowing about science* dimension addresses the historical and epistemological aspects of each of the fields of knowledge. Finally, *knowing how to do science* aims to address the production processes and methods of science, as well as its limitations. Figure 4 presents some images from the series.

The other itinerary already in operation is called Trilha da Luz ('Light Trail'), and is intended for children, dealing directly with how the various areas of science understand and use light. The trail consists of only six points, with the objective of reducing the total distance covered, considering the target audience. This second experience can be considered to be a result of reflections concerning the first trail, since developers noticed the potential to address not only the public in general, but also specific groups. Nevertheless, the aim is always to have content that can be appreciated by diverse profiles, both adults and children, for example, as it is very common that mixed groups visit the campus.

The series of videos developed for this second itinerary is called 'The adventures of Ultraviolet and her companion Photon', and consists of six episodes (with an average duration of five minutes each) which narrate the adventures of Clarice and her dog Nub, the secret identities of the heroes, Ultraviolet and Photon, who count on the help of Guaraci, Master of Light, to unravel the mysteries that arise in situations that also involve their friends Helena and Luizo (Figure 5). All the characters are represented by foam puppets, because of the familiarity of children with this style. The episodes are associated with six distinct areas of knowledge, in which specific approaches to the phenomenon of light were selected: chemistry



**Figure 4.** Images from some of the episodes of the Knowledge Paths series, its presenters in the studio and in some of the spaces where points of the museum are located, together with some of the scientists interviewed (Source: Authors, 2022)



(chemiluminescence), biology (photosynthesis), astronomy (life of stars), health (structure and functioning of the eye), physics (decomposition of light) and microscopy (functioning of the microscope). In addition to attention to the quality of the narrative (developed in partnership with specialised screenwriters) and to the accuracy of scientific concepts, there were also pedagogical reflections to consider for the audience for which the production is intended, which resulted, for example, in the adoption of redundancy as a methodological strategy (Pezzo et al., 2018).

The production of the series began during the celebrations of the International Year of Light in 2015, and also involved training activities for future science teachers, which gave rise to the first ideas for its scripting.

In addition to the production of specific content, the development of the project (both trails) also required an effort to curate complementary materials to be made available at each point, such as texts, photographs, scientific papers and other videos related to the topics covered in each of the locations. An interesting aspect observed after the beginning of the operation of the project is the fact that the inclusion of these materials can take place continuously, both in the sense of updating knowledge in the covered area and of serving as a geo-referenced repository on the subject.

The beta version of Knowledge Paths went into operation in 2015, and since then it has been accessed more than eight thousand times via mobile devices, and around twelve thousand times on the

Figure 5. Characters from the series 'The adventures of Ultraviolet and her companion Photon' (Source: Authors, 2022)



web. Currently, the digital platform is undergoing an update and, with the end of the restrictions imposed because of the COVID-19 pandemic, the operation of its 2.0 version should start, with the expansion of the points of interest, taking into account other areas of knowledge (psychology, literature and social sciences). Two new itineraries dedicated to ornithology and music will be implemented in the near future, together with an audio guide.

In addition, monitored activities will be intensified, with the expansion of the number of monitors and the offer of a greater number of available hours and partner laboratories that are willing to receive visitors, further expanding the educational possibilities of the project.

## Conclusions

The approach used in designing the virtual and outdoor museum Knowledge Paths has been shown to be an interesting alternative to traditional science centres and museums, in terms of the lower costs involved, the lack of need for physical collections and the flexibility offered by the platform, with the possibility to add new themes and content. In addition, as we have discussed, the adopted strategy brings the public closer to the sites of knowledge production, their dynamics and, most importantly, their actors, allowing a contextualised understanding of issues related to science.

Another aspect that emerges from the proposal is the possibility of the use of this approach by traditional science centres and museums in their immediate surroundings, in order to break down the symbolic barriers of their walls and to explore the educational possibilities of the real-life territories where they are located, providing multidimensional experiences related to their main subjects of attention, and encouraging proximity to the public.

The implementation of the project also raises some new questions to be explored in further studies, such as: public perceptions of Knowledge Paths, the trails and topics covered; the way in which the content presented on the platform is understood/enjoyed by users; strategies to assimilate contributions from the public to the content provided, thus promoting collaborative production of knowledge, participation, critical thinking and, eventually, even citizen science experiences; and how the adopted approaches encourage further reflection on the relationship between science, technology and society, and greater integration of interactors with scientific culture.

Although the main purpose of this paper is to share the theoretical framework, methodological choices and development process of the project, there are some first impressions and reflections about the experience to be shared, which support the development process of the project's new platform.

Concerning access to the platform during physical visits (through the QR codes), the team anticipated the possibility of limited access to the web, so guides carry tablets with them with an offline version. For spontaneous visitors, the campus now has almost full Wi-Fi coverage. Written links will be added to new totems in order to guarantee access to people with no familiarity or tools to access through QR codes, since the team received some doubts about how to use the technology (although not many).

The team has also realised that it is necessary to build in strategies to collect data about users' experience. For the physical visit, for example, there is no access control to the campus, and all data about spontaneous visits are lost. Also, in the virtual environment, the original framework only gives data concerning numbers of visitors, with no more detailed statistics about their profiles and interaction with the platform. Concerning the virtual environment, tools aimed at collecting this information will be embedded in the new version (which has been partially developed, and which still depends upon additional funds to be completed).

In the guided tours, teenagers were the main public, and some insights came from developers and guides observing their interaction with the totems, paths and content. The main insight is that there is a lot to distract visitors between two sites of interest, especially when there is a greater distance between them. This was already considered when designing the trail for children, with fewer and closer sites of interest (which only partly solved the problem, as distraction between sites can still occur), and it also highlighted how each site must make sense alone.

Further, aiming both to promote engagement throughout the trails – not only at the sites of interest, but also along the path between them – and to collect information about users' experience, the new version will be gamified, adopting elements from the game universe in the context of the project, such as tasks to be completed in order to receive rewards, quiz experiences and teamwork. This strategy may also allow the delivery of tailored experiences and content to different profiles.

More important is the priority now given to increasing partners at the various laboratories and other research facilities located on the campus. This decision is related to the perception that these concrete – as opposed to virtual – interactions inside the places where scientific knowledge is developed continue to be essential to promote cognitive and affective bonds, but it has a focus also on scientists themselves, since the first partners involved consistently report a new sense of responsibility emerging from the experience and, above all, from the opportunity to talk to people outside the academy about their fields of knowledge and everyday routines at the university.

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## Declarations and conflicts of interest

### Research ethics statement

Not applicable.

### Consent for publication statement

Not applicable.

### Conflicts of interest statement

The authors declare no conflicts of interest with this work. All efforts to sufficiently anonymise the authors during peer review of this article have been made. The authors declare no further conflicts with this article.

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