Routledge
Taylor & Francis Group

Journal of Community Archaeology & Heritage

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ycah20

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To cite this article: Juan F. Gibaja, Gerard Remolins, Silvia Valenzuela, Santiago Higuera, Ariadna Nieto, Olga Palma, Araceli González, Xavier Oms, Vanessa Guzmán, Miriam Cubas, Alba Masclans & Millán Mozota (2021) Inclusive archaeology: Scientific outreach among 'forgotten collectives' in the streets of Barcelona (Spain), Journal of Community Archaeology & Heritage, 8:3, 160-177, DOI: 10.1080/20518196.2021.1873539

To link to this article: https://doi.org/10.1080/20518196.2021.1873539

Published online: 19 Jan 2021.

JOURNAL OF COMMUNITY ARCHAEOLOGY & HERITAGE
2021, VOL. 8, NO. 3, 160–177
https://doi.org/10.1080/20518196.2021.1873539

Inclusive archaeology: Scientific outreach among 'forgotten collectives' in the streets of Barcelona (Spain)*

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ABSTRACT

Since 2013 we built a working group formed by researchers, educators, social workers, communicators and educational psychologists to bring archaeological research to all types of audiences, especially those with limited access to scientific dissemination programmes. In particular, we refer to people with psychological disorders or physical disabilities, older adults, newcomers, social groups traditionally marginalized and people at risk of social exclusion. These groups are usually left out of scientific outreach projects. We regard this neglect as serious as we believe in an inclusive society and the neglect is exclusionary. This work covers archaeological outreach activities engaging with some groups that usually do not participate in, and enjoy, science, specifically with people with intellectual disabilities and mental illnesses, recently arrived immigrants, the elderly and Romani people. Although initially, our activities began in the neighbourhoods of the city centre of Barcelona, today they have spread to other cities in Spain.

KEYWORDS

Inclusiveness; well-being; archaeology; scientific outreach; prehistory; Barcelona; Spain

Introduction: new audience, new forms of outreach

In the last two decades, many archaeologists and researchers chose to include scientific outreach activities in their academic track records. This resulted in increasingly common sessions on outreach at international conferences, such as the European Association of Archaeologists (EAA), and the Society for American Archaeology (SAA).

A number of published studies show this growing interest and awareness of dissemination: books and papers using such terms as 'public archaeology', 'community archaeology' and 'democratisation of archaeological communication' (Schadla-Hall 1999; Ascherson 2000; Matsuda and Okamura 2011; Almansa 2013; Almansa et al. 2015; Richardson and Almansa 2015; Moshenska 2017).

With those terms, one might think that current researchers design programmes for scientific outreach in general, and those connected with archaeology in particular, for all kinds of audiences.

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*In remembrance of our eternal friend María Casas.

However, in our experience, this is not true. Most activities organized by museums, archaeological parks and companies working in dissemination focus on very specific target groups: children, teenagers, middle-class and upper-middle-class families, and tourists in some cases. They forget and neglect numerous groups that do not enjoy science in the way that thousands of other people do every day.

In our case, we organize outreach activities in the streets, squares, and social-cultural centres of the city of Barcelona (Spain). In some neighbourhoods in the city centre, and specifically in the Raval neighbourhood, a large part of the population suffers serious problems of social exclusion. There are multiple causes of such exclusion: their areas of origin (as is the case for immigrants coming from countries not belonging to the European Union); belonging to certain marginalized groups like the Romani people; the high degree of illiteracy or dropping out of school; the abundant number of unemployed people and for more serious reasons such as the ubiquitous presence of prostitution and drugs. But apart from the particular idiosyncrasy of this neighbourhood, our outreach has also included institutions in different parts of Barcelona dedicated to people with intellectual disabilities. All these groups, for one reason or another, do not usually participate in outreach activities related to science, beyond those required during the school period.[1]

Given that a significant number of people have special needs, we wonder why many educators, academic staff, social agents, politicians, and museum curators, among others, rarely think of those groups when they design their outreach programmes. As a result, the people belonging to those groups, together with their families and teachers, are surprised when someone shares with them the science and knowledge that thousands of researchers generate every day. The exclusion of these groups is so widespread that society in general does not think about it when they visit a museum or an exhibition.

However, the preamble to the principles of the Convention on the Rights of Persons with Disabilities (United Nations 2006), and its Spanish equivalent 'Código de la Discapacidad', state:

- *(Art. 5)* Recognizing that disability is an evolving concept and results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others,
- *(Art. 10)* Recognizing the need to promote and protect the human rights of all persons with disabilities, including those who require more intensive support,
- *(Art. 11)* Concerned that, despite various instruments and undertakings, persons with disabilities continue to face barriers in their participation as equal members of society and violations of their human rights in all parts of the world,
- *(Art. 13)* Recognizing the valued existing and potential contributions made by persons with disabilities contribute to the overall well-being and diversity of their communities, and the promotion of the full enjoyment by persons with disabilities of their human rights and fundamental freedoms and of full participation by persons with disabilities will result in their enhanced sense of belonging and in significant advances in the human, social and economic development of society and the eradication of poverty,
- *(Art. 22)* Recognizing the importance of accessibility to the physical, social, economic and cultural environment, to health and education and to information and communication, in enabling persons with disabilities to fully enjoy all human rights and fundamental freedoms.

In contrast, even a glance at current outreach activities reveals that a huge gap exists between those principles and reality. Faced with this situation, we understood that our knowledge about prehistory and archaeology should reach all sectors of the population if we wanted to contribute to the democratization of science. It was a complicated challenge because our experience with certain groups was non-existent. This was the case of people with physical and mental disabilities, and with the Romani community. And, of course, each of them had their own characteristics. We had to learn and understand the best way to explain the scientific content for every group. The key

aspect was acquiring a better knowledge about them with the help of their relatives, caregivers, friends, and their own opinions. For that reason, the key question was: What can we do to change this situation? In this paper, we describe the methodology we developed, the types of activities designed and the ways of assessing the activities and ourselves as educators. We hope that our experience will help guide other researchers and educators so that ultimately, we can achieve an inclusive science, accessible to all.

We developed the experience described in this article in the course of four scientific outreach projects funded by the Spanish Foundation for Science and Technology (FECYT), Ministry of Science, Innovation and Universities, Spanish Government.[2]

Fortunately, more and more institutions and colleagues are joining the fight to achieve inclusive, participatory science, adapted to the particularities of people who want, and have the right, to enjoy scientific advancements. The activities they organize are born of different scientific disciplines, sometimes as a result of personal initiatives, but also from the concern of institutions such as museums and centres dedicated to heritage. These institutions open their doors, making their spaces accessible and their speeches understandable, recognizing the benefits that it has for the health and well-being of visitors. All of them, in one way or another, have inspired us as they have objectives similar to ours and they apply methodologies and didactic tools that we also explore and practice (Phillips and Gilchrist 2012; Ander et al. 2013; Gómez et al. 2014; Kajda et al. 2015; Morse et al. 2015; Fesharaki et al. 2016; Minuesa 2016; Iglesias et al. 2017; Herrero et al. 2017; Farrell-Banks 2018). In our work, we refer to some forgotten groups in the outreach programmes, but it is evident that in other countries similar or different groups are the target of inclusive outreach; and in some cases, they represent significant portions of the population. In the case of archaeology, reference could be made, for example, to the work that certain researchers are carrying out with indigenous or military populations that have suffered psychological and physical trauma (Greer 2010; Winterton 2014; Thomas 2017).

This work is structured in three parts: (1) the methodology used (explaining the public with whom we have collaborated, the mode of communication, the didactic tools used and the places where we have acted), (2) some examples of the activities carried out with different groups and (3) observations and conclusions.

Method and assessment of the results

Public

We initially thought that our dissemination activities worked for all audiences; however, we soon realised that this was not the case because some groups, such as persons with an intellectual or physical disability, immigrants, senior citizens, and Romani people never took part. This was not because of the places in which the activities were held, as most of them took place in the streets, social centres, and schools in the districts of Barcelona where those people live, work or travel.

Before working with those groups, we decided to find out what types of outreach programmes were organized in more specialized centres, such as museums and archaeological parks, as it was prudent to know the methodologies and educational tools that they were using. We were quite surprised to discover that the majority of the museums of Barcelona did not tailor specific activities to people with special needs, did not adapt the language to their special physical and cognitive requirements, and they did not employ staff with the appropriate qualifications and experience to address these special needs audiences. We felt, therefore, as if we were starting from scratch.

We needed to learn how to act and what activities we could carry out, and we decided to speak with the people who best know the groups to which we wanted to direct our programming; specifically, their psychologists, workers in the social and educational centres they attend, and – above all – the people themselves. They are the ones who are most aware of their needs, behaviour, interests, potential, limitations and wishes, and of the best way to transmit our knowledge.

In our experiences, none of these groups were homogeneous. This is visible in various aspects including their educational level, interests, prior knowledge, level of attention and degree of involvement. Although *a priori* we perceived this diversity as a potential obstacle, in the end it was not. The support of social workers, museum educators and teachers, and our target audiences' engagement in the process, provided constant assistance. In the case of people with disabilities, we often decided to work in a more individualized way, paying attention to their expressions and body language, which indicated if they were following the activity or lost interest in our explanations.

We have worked with the following organizations and associations:

- Asociación Down Catalunya (http://sindromedown.cat/es), TEB cooperative group (http://www.teb.org/es) and Taller Sant Jordi – people with intellectual disabilities.
- Carabutsí and Inter-Acció associations – Romani collective.
- In the case of senior citizens, we carried out different activities in social and socio-health centres: Centro Cívico Folch i Torres, Centro de la Tercera Edad Josep Trueta, Asociación Milenium for people with dependency, Cooperativa Suara, Asociación Nou Horitzó and Hospital Clínic de Barcelona.
- Cooperativa Impulsem for employability and Miquel Tarradell and Consell de Cent secondary schools in the case of newcomers.
- Moreover, we recently started a collaboration with the Antaviana Unit for the reintegration and resocialization of patients with mental disorders (Parc Taulí Hospital).

Communication and educational tools

Based on previous science outreach experience, we developed and applied the following three-phase approach:

Phase 1. Confidence and participation. In the presentation of the activities, we established a positive atmosphere and built confidence among the public, educators and researchers. This facilitated the contribution and involvement of all the participants. We think it is important to achieve a pleasant environment with the help of the caregivers, the workers of the centres where they carry out their activities and even their relatives. Our language is simple, our gestures friendly and our dress code adapts to theirs. It is important that there is no barrier between the researcher-disseminator and the public. We do not want our attendees to refuse to participate or ask questions because they think that their knowledge is insufficient.

Phase 2. Encouragement of values through the activities. The participants' self-esteem, collective value and acquisition of new knowledge were encouraged, as well as their engagement and cooperation with one another. It is important to empower participants so they assume that what they will do or ask will not be wrong, and that they recognize value in their effort and work. Furthermore, our experience shows that the results are more positive when the public collaborates since this generates debates and synergies.

Phase 3. Knowledge transfer. The participants would transmit the concepts, experiences and knowledge acquired in their immediate social circle.

All these phases require a simple and clear language. Although this is basic in any outreach activity, the situation is much more difficult with people who have not completed their education or who are functionally diverse. Understanding and retaining abstract or complex concepts is very hard in those cases. As well as being very rigorous in the scientific information, the language must take care of such aspects as gender relationships and roles, religious beliefs, cultural and social differences, etc.

The difficulty in comprehending some concepts can be minimized through the type of educational tools that are used and the active participation of the audience. In our experience, practical, hands-on and experimental activities achieve the best results. We think that the dissemination that

we do is only possible if all the agents play an active part. This means participants cannot be passive listeners whose involvement ends the moment that the activity finishes. For us, citizen participation is so important that it is not only necessary to involve them, but also to make them take part in the decisions, development and organization of the activities so that they too become constructors knowledge (Ortega 2003, Neal 2015, Belford 2014). This approach connects us directly with the principles of participatory governance of the European Union, particularly those principles related to cultural heritage as both a relevant value of living societies and a resource for sustainable development of such societies. In general, we agree with the conclusions of the European Council at *2014 Council conclusions on participatory governance of cultural heritage* (2014/C 463/01). Nevertheless, we think that participatory governance should require a real effort from public institutions to promote the participation of all social sectors, especially in the evaluation and decision-making levels of science, heritage and dissemination programmes.

Places

The people whom we serve move through the very places in which we held our activities: streets, squares, and shopping centres; social centres for children, youths and the elderly; cooperatives for employability; institutions for the disabled; primary and secondary schools, etc. Although the first contact always occurs in those places, we also like them to know the places where archaeologists work: excavations, museums, research institutions and universities.

One of the areas where we carried out most of our activities was Old Town Barcelona, Raval district. This area of Barcelona currently has one of the highest population densities in Europe, as about 49,300 people inhabit an area of 1.1 km^2. Many of them are elderly and live alone, or are newcomers, who make up c. 43% of the population. Unlike the native Spanish population, newcomers only rarely take part in neighbourhood activities and tend to gather in associations connected with their nationality or religion. Most of the immigrants in El Raval arrived in the last decade, particularly from countries outside of the European Union, such as Pakistan, Bangladesh, Morocco, the Philippines and India.

Indeed, El Raval does not normally appear in science and culture news items in television, radio and the press, even though it is one of the parts of the city with major cultural institutions, such as the Liceu Theatre, Museum of Contemporary Art, Catalonia Film Theatre, the Maritime Museum, Barcelona Centre of Contemporary Culture, the University of Barcelona and a research centre of the Spanish National Research Council itself.

In contrast, the media reflect and amplify the negative news connected with prostitution, drugs, delinquency and the proliferation of socially excluded people and the insufficient integration of new immigrants in the city (Carmona 2000; Fernández 2014).

Assessment

We have made a considerable effort in recent years to assess our activities. Although during our first activities we made a superficial assessment, of a qualitative nature, on the opinion of the attending public, later we understood that it is very important to know much better how the whole process works. This has involved the following steps:

- On-site observation by an educational psychologist. This psychologist evaluates multiple aspects: appropriateness of venue; suitability of images and the teaching tools; public reponse; our way of explaining, the language and the gestures we use; the opinions of caregivers and family members; and compehension of the content.
- Recording of photos or videos of the activities. They are perfect tools to observe the degree of public attention. It helps us understand if they have lost interest, if the spatial distribution of materials, people and working or debate areas were adequate, if the- participants have interacted

among themselves, etc. Whenever we have taken images of minors, as well as adults with intellectual disabilities or mental illness, we have asked the permission of their parents or guardians. For the rest of the population, and whenever interviews have been conducted, their permission is requested to record, photograph, or publish their name. Except for a minor for religious reasons and elder people with mental illness, in no other cases were we denied permission for taking pictures or using the names of the people whom we interviewed.

- A simple survey that can be understood by any kind of public. We used surveys in which participants responded with images of smiling faces and grimaces to facilitate feedback from people who for different reasons are unable to write correctly or suffer from difficulties with the written language. These anonymous surveys were not carried out in front of us, but in their own work or meeting centres together with their educators, caregivers, or families. In this way we got them to be much more sincere. In our experience, when the surveys are done in front of the outreach presenters, the opinions are always much more positive because they are being observed and they feel compelled not to criticize.
- Direct enquiries of the teachers and educators who accompany the different groups. This information is essential because they are the ones who best know the public they are accompanying. They help us by explaining certain characteristics of people in relation to their disability, their social condition, the relationship they have with their peers, etc. In addition, we establish a dialogue not only before the activity, but also afterwards, after they speak to the participants outside the place where the activity took place and not in front of us.
- Detailed surveys among the researchers and technicians taking part in the activities. It is also important to know how the scientific-disseminators responsible for the outreach activity feel about it and their evaluation of the outcome. As an example, the educational psychologist asks them about: positive and negative aspects they perceived in relation to the public's attitude; their opinion on the effectiveness of the didactic tools; feedback received by the public; degree of collaboration with the caregivers and families; level of satisfaction with the whole experience; and if they think that there has been a satisfactory knowledge transfer.

The educational psychologist, having analyzed the data, assessed our programme, including all the positive and negative aspects that might have influenced comprehension of the subject matter. In this regard, it has been enormously important to identify which concepts or means of transmission have been the best and which need to be improved or discarded.

Case studies

The best way to explain our outreach methods is by describing some of the numerous activities that we do and which most differ from the ones usually offered by museums, educational centres and even such events as 'Science Day', 'Researcher's Night' or 'The Night of the Museums'. They all begin in a different place: a street, a square, a cooperative, or a centre for the elderly or for the disabled, and consist of a programme of activities that lasts for several days or weeks. In these activities, the main actors are not the researchers but the participants themselves. The objective is for the participants to convey what they have learned to their families and friends. To do this, preparation and collaboration with their families and educators are essential. Their opinions and experiences are fundamental to define how we can carry out the activity, what we can teach and how, and for how long the activity can last. All the activities that we are going to present here continue today, with the exception of the pottery workshop aimed at people with Alzheimer's and Parkinson's disease. This workshop was suspended for the time being, since the elderly who served as teachers have not continued with the activity. We have started an outreach programme aimed at explaining prehistory to the penitentiary population of Barcelona province and we made the first contacts to start workshops with children and young people affected by cancer. All this thanks to the network of collaborations and contacts built since 2013 and the funding offered by the Spanish Foundation for

Science and Technology (FECYT) and the Spanish National Research Council (CSIC) of the Ministry of Science, Innovation and Universities.

The path followed to reach all these groups wasn't always an easy one. We meet them at their working or social places: occupational centres, associations, schools, nursing homes, hospitals, health centres, prisons, etc. The network of contacts and collaborations has grown exponentially. Indeed, many of the new initiatives in development come at the suggestions of the coordinators of such centres and associations. Although, in general, the response of the people we have contacted was very positive, it is no less true that some of them did not find our proposals interesting. It is also important to say that first contact often is not easy. For example, we often confront the suspicion that we are going to ask for money or that our interest in these groups is an imposture (that is, we are only thinking in our own benefit). In most cases, however, suspicions dissipate as we get to know each other and work together.

Puppet shows performed by senior citizens and Romani women

The puppet shows were among the activities that most attracted the attention of the children and adults alike. This activity is designed for children, although the interaction between the actors and the children, as well as with their families, is very interesting. The puppeteers explain the way of life of the first Neolithic societies that settled in Barcelona. Two puppets narrate a story about archaeologists and Neolithic peoples and, during the show, three figures (that did not exist in the Neolithic) appear, so the children need to tell them to leave the scene: a dinosaur, a mammoth, and a glass bottle. With this simple story, we wanted the children to retain a few basic ideas. When the show ended, a professional archaeologist answered all the questions they wanted to ask. A group of people who attend a day centre for the elderly in Barcelona made the puppets, the stage, and the show itself. Therefore, the grandparents (not the archaeologists) explained the story to the children.

Many of these children had heard very little about prehistory, apart from some distorted ideas with hardly any scientific basis from films and television cartoons. Their conceptions of prehistoric societies, therefore, were very different from those documented by archaeologists. They were unable to situate the Neolithic chronologically and knew little about the tools and objects that those societies made. They usually thought that dinosaurs and humans had lived at the same time and did not know the difference between an archaeologist and a palaeontologist. The puppet players and experts explained these concepts so that they would remember them. At present, a group of Romani women perform the show, while being advised by the senior citizens. The women have modified the script slightly and made it longer and funnier. They also enriched the show with live music (Figure 1). The music style they use is the Catalan Rumba, which is a typical style among Romani communities in the city of Barcelona. The genre was born in the city and it is representative of the Romani collective in general. The link with the Romani community, and specifically with the Carabutsí Association, started thanks to the mediation of a social centre located in the Barrio del Raval (Folch i Torres), in the centre of the city of Barcelona. The association contacted us to help them organize a study on the historical memory of the Romani community in Barcelona. That contact generated many synergies: we started to collaborate in the collection of the aforementioned historical memory, but also with other initiatives such as the puppet theatre, the organization of a musical contest and the creation of a museum of the Romani community of Barcelona. The objective of this association is to share the Romani historical experience of Barcelona, break stereotypes about their community, and to encourage young people and convince their families about the importance of continuing to study, showing that they too can become researchers. In this regard, it is important to note that the school dropout rate among the Romani community is very high.

This has undoubtedly been one of the more successful of our activities. They performed the play in different places: streets, squares and schools, shelters for homeless families, youth centres and day

Figure 1. Puppet show performed by a group of Romani women in Barcelona. Photo by Juan F. Gibaja.

centres for the elderly. Archaeologists participated in the puppet theatre, preparing all the core contents and advising on the elaboration of the clothing and tools used by the characters. One of our basic principles is that all activities, but especially those that are more playful in nature, must be supported by solid scientific evidence and knowledge. They need to be both fun and scientifically rigorous. The public must come to understand what parts of the performance are based on scientific data and which are artistic license.

Taking part in archaeological work

To explain the everyday work of archaeologists, many museums prepare boxes or spaces full of sand in which they place replicas of artefacts that the children must find. Although this attempts to simulate an excavation, we believe that the results tend to be negative, as the participants end up regarding the activity as a 'treasure hunt'. This is not only our team's subjective assessment, it is shared by other archaeologists dedicated to scientific dissemination, museum curators, and even teachers and users who have participated in both 'treasure hunt' excavations and in our archaeological excavation simulator, the foundations of which we explain below.

In our opinion, the 'treasure hunt' approach leads to a complete loss of scientific rigour and a lack of understanding of the methodology and purpose of archaeology.

A very different idea is the Archaeodrome, organized by the universities of Cordoba, Valencia and the Balearic Islands. As they were aware of that lack of scientific rigour, they created simulated excavations, in which the participants follow the same methodological approach as employed on a real archaeological excavation (Gil et al. 1996; Javaloyas et al. 2013; Ruíz and Vázquez 2017).

In our case, firstly we decided that one of the most dynamic and simple ways of explaining archaeological work was to take the public to a real excavation. We understood that active participation with the archaeologists themselves can be an outstanding method of understanding an excavation. This same proposal has been made by other archaeologists, although it is common in the field of museums in relation to heritage and art (Bardavio et al. 2004; Phillips and Gilchrist 2012; Minuesa 2016). Thus in 2018 and 2019, thanks to the collaboration of Dr Xavier Oms at the University of Barcelona, we organized two sessions in which two groups of individuals with Down syndrome

took part in the excavation of the Neolithic site of Les Guixeres de Vilobí (Sant Martí Sarroca, Barcelona). We made contact with these groups through collaboration with the Down Catalunya Association, dedicated to people affected by this condition as well as their families. With them, we carry out various outreach activities: conferences on prehistory, archaeology workshops to learn about ancient hominids and their tools, and the archaeological excavation itself. The activity began some days beforehand when the participants received a dossier that described the type of deposit, its chronology, the objectives of the excavation, the methodology employed and the remains that they might find. In this way, they reached the site with an idea of the methods and tools they would use. We knew the value of these materials from the experiences of other researchers in the Archaeodromes mentioned above (Gil et al. 1996).

On the day of the excavation, each participant worked with an archaeologist (Figure 2). In this way, they achieved individualized collaboration and learning. The archaeologists explained numerous points, such as the characteristics of the site, the tools they used, the reasons for laying out a grid system, the need to sieve the sediment, the way of determining the coordinates of the objects, etc. We soon observed that in most cases each pair developed an excellent, cordial relationship. While we expected reduced excavator efficiency, at the end of the day this was minimal. The results were fully positive in both our science dissemination effort and regular work. In the words of the site director: 'All the workers, without exception, were delighted with the experience. We found it useful and the archaeologists had a great experience'. Nine of 12 workers described the experience as excellent. The rest considered it a more mixed experience as the participants with Down syndrome posed some difficulties, as they suffered fatigue when working in a forced position on the ground and with high temperatures of Catalonia's summer. As it was a new experience for our archaeological team, before starting the activity we explained how to act, speak, and explain the concepts to the participants. For example, we told them that participants were adults, so they should be treated as such, not as children. We also explained that participants could have certain difficulties in understanding explanations. This is usually solved by repeating, using sensible, simple and non-technical language. Archaeologists' fears about this situation, a product of preconceived ideas about people

Figure 2. People with Down syndrome taking part in the archaeological excavation at Guixeres de Vilobí. Photo by Juan F. Gibaja.

with Down syndrome, disappeared in a few minutes. They all adapted to the circumstances and enjoyed the experience.

The relatives and friends of the participants remained outside the excavation area, watching how they worked, although they asked numerous questions about the site, about prehistory and excavation techniques. Although it might seem that these relatives played a passive role, the archaeologists and the participants transmitted to them a great deal of information. We also received feedback from them. Victor Saura, one of the parents of the participants, has an opinion that is quite representative of all the relatives: 'Honestly, I do not remember any family commenting on anything minimally negative about the experience. If I had to change something, maybe I'd add something more didactic before going to the excavation site'. Again, we took good note of such feedback. The reactions of the participants appear in a short online video (IMF-CSIC, 2017).

On the other hand, the problem with organizing activities at a real excavation or a simulation, like the archaeodromes, is that the public has to travel to the site. Therefore, thanks to the Regirarocs SL archaeological company, we created a virtual excavation with photographs and replicas of archaeological artefacts that easily can be transported and mounted anywhere. The virtual excavation simulates an archaeological site with different layers covering a Neolithic burial. Then the participants must record the mortuary structure and all the objects (skeleton and grave goods). Later, each one must explain to the group what they found in their square and all together, they must interpret the site. This virtual excavation is suitable for all kinds of groups. We worked with very young children (5 years old) accompanied by their parents, teenagers, and intellectually disabled people (Figure 3). They all understood the objectives and methodology of the excavation more or less rapidly. We conducted a series of surveys among the participants. The results regarding the evaluation were overwhelmingly positive.

The main advantage of the virtual excavation is that it is easily transportable, cheap, and adaptable to any particular setting. Thus, we can make as many levels as we like, representing different archaeological deposits. In this regard, we are currently working on another example based on

Figure 3. Virtual excavation for people with intellectual disability (created by the Regirarocs company). Photo by Juan F. Gibaja.

two sites in Rome; a Neolithic underwater site (La Marmotta) and one from the classical world (Tusculum).

Prehistoric cookery explained and performed by young newcomers

This activity exemplifies the relationship between the acquisition of certain knowledge and practical, hands-on activities, without losing scientific rigour. We approached prehistory through food and cookery with two groups of young immigrants, most of whom had recently arrived in Barcelona from different countries (Pakistan, India, Morocco, Syria, etc.). They all attended 'Milà i Fontanals' secondary school (not to be mistaken with Mila y Fontanals CSIC premises) and Consell de Cent secondary school, in Barcelona city centre. They had great difficulties in following the classes, especially because of language problems and therefore many of them could not complete their school studies satisfactorily.

Together with their teachers and the educators in Impulsem Cooperative for employability, we held a cookery course lasting four months (Figure 4). During this time, students attended several classes about prehistory in general and the different foodstuffs that our ancestors gathered, hunted, and domesticated. Each group of students attended four sessions in which both theory and sensorial and practical aspects were adapted to their language and educational characteristics. The classes included an introductory general session and three workshops about terrestrial animals, terrestrial plants and marine animals and plants (with the contents related to human alimentation).

The next step was to learn a series of cookery techniques related to the products that people ate in the past. With a chef, we designed a menu that in the end they cooked and served to their colleagues, relatives, teachers, and researchers. In this way, they felt empowered and satisfied with the work they had done and the collaboration with their colleagues. We received this input directly from the boys and girls participating in the activity and from the teachers and monitors. The opportunity

Figure 4. Students from Milà i Fontanals secondary school during the prehistoric cookery course in the Impulsem Cooperative. Photo by Juan F. Gibaja.

to cook and serve – to cater – in CSIC premises was especially appreciated. A short online video shows some reactions and evaluations of the participants in the activity (IMF-CSIC, 2018).

This is one of our most successful activities, and many secondary schools from Barcelona districts asked to participate through the Impulsem cooperative. We have organized four cookery courses for such groups. In this activity, the youths not only learnt about history and cookery, but the Impulsem Cooperative awarded them a certificate that would help their employability.

Prehistoric pottery workshop for senior citizens

One of the most effective ways to approach prehistory for the elderly is through workshops. At the social centres they organize different kinds of workshops: dancing, singing, cookery, handicrafts, etc. Our idea was to find out what their interests were, then adapt and shape the workshop around a topic connected with prehistory. This led to the programme we carried out in 2018 with a group of men and women who made pottery in Josep Trueta Centre in Barcelona.

As we had done with the cooking classes, we gave a series of talks about prehistory and, particularly, about prehistoric pottery and the pottery made with traditional techniques by modern communities in northern Morocco. Next, the participants developed their own research, with the support of the teachers. With this information, the pottery group made a set of vessels with the same techniques, shapes and decoration used in prehistoric times.

Finally, we arranged an exhibition of their hand-made pottery in the research centre of the CSIC in Barcelona and a social centre in Barcelona city centre (Folch i Torres). The participants then offered a series of lectures to the researchers, relatives, and friends, in which they explained their opinions, thoughts, fears and experiences. In this way, they became central to the activity (Figure 5).

The activity, however, did not end there. In 2019, the pottery group organized a workshop in which they taught people affected by Alzheimer's and Parkinson's diseases in Barcelona Clinic Hospital how to make prehistoric pottery. This last step was doubly important for us and extremely satisfying. On one hand, they conveyed what they had learned from us about prehistory and pottery. On the other hand, their action had a therapeutic effect, as stated by the Clinic Hospital caretakers responsible for these patients. We received this feedback from the Clinic's Caring Unit: 'People with Alzheimer's and Parkinson's diseases just said they liked it a lot. There was no survey to not overwhelm them and for the matter of memory. In any case, the activity about the pottery workshop was always very happy and lively'.

Assessment

We are so used to repeating our discourse that, sometimes, we are unaware of factual errors and lapses in clarity. As mentioned above, in recent years we made a concerted effort to assess what we do and how we do it. The results have been very positive, in terms of participant feedback, in correcting the errors we made when we used a certain kind of language and the incorrect use of some educational tools. This information allowed us to improve further those aspects that yielded positive results and change or eliminate those that were not effective.

Although it is clear that each group has different needs and capabilities, this study shows that collaboration between researchers and teachers/educators is extremely useful when they share information and practical knowledge before the activity. In the case of researchers, it is essential to assess the characteristics of the public: their ease or difficulty in understanding certain concepts; the language and the optimal tools for the content to be understood; tone of voice; duration of the activity; the need to take occasional breaks, etc.

After analysing the answers to the surveys among the different groups, we saw that the assessments generally were very positive; however, some aspects needed improvements specific to the groups with which we worked.

Figure 5. Margarita Martín making a recipient in the prehistoric pottery workshop. Photo by Juan F. Gibaja.

Regarding people with cognitive disabilities, we need to improve how we transmit information and concepts. For example, we noticed that the participants did not understand some words that archaeologists habitually use, such as 'deposit', 'flint' or 'date'.

The use of 'hands-on' materials is crucial, as they can experience and understand what we want to tell them with such objects. They have also helped us to realise that we cannot lecture for more than about half-an-hour, speak monotonally, or include several photos in the same slide. In those situations, they lost concentration and interest. In the case of the images, we found that it is difficult for them to take in too much information in a few seconds.

Most of the young people enjoyed the cookery workshop. Not only because it was a way to learn how to cook, but also because the explanation through prehistory touched on several points affecting their personal and social development: racism, male chauvinism and group belonging. Communication, however, was not always easy owing to immigrant youths' low level of Spanish, their lack of formal education in their home countries and their lack of motivation for listening to scientific outreach. They tended to disconnect from the explanation or appeared to be bored.

Before beginning activities with senior citizens, we need to consider their educational level, as that will help us adapt the programme to make it more comprehensible. Equally, if any of the participants have problems with mobility, hearing, or eyesight, we should seat them at the front of the venue so that they can follow the explanations. They usually display interest when we discuss aspects related to their own experiences. For example, when talking about agriculture, we showed them traditional tools that many of them recognized because they had used them in their childhood or seen how others used them.

To sum up, it is possible and necessary to work with all of these very diverse groups. It should be made very clear that the categorization of 'dis-ability' is not a consequence of their limits, but of our own inability to provide the ideal means and resources to extract their potential.

Conclusions

We often hear at the start of an educational programme that it is suitable for 'all kinds of audiences'. The reality, however, is very different. Most museums and science courses work for very specific groups: children, teenagers, and families, normally with a medium-high educational standard.

In recent years, we have attempted to work with other groups: disabled people, senior citizens, newcomers, and people in danger of social exclusion. People that researchers and institutions usually forget, for many different reasons, when organizing outreach activities. This makes them think that they cannot take part in such activities, further marginalizing them. However, bearing in mind the principle that science should reach all sectors of the population, whatever their age, studies, and intellectual and physical ability; scientists, educators, educational psychologists, politicians, etc. must be able to develop educational tools through which everybody can enjoy science and acquire knowledge in a simple and enjoyable way. Our experience shows that practical, hands-on, and participatory activities provide the best results.

We can achieve optimal results in a familiar environment; therefore, it is in our interest to bring activities to the social-educational centres they attend each day or in their workplaces. We also think it is important that they know where researchers work, so we always arrange a visit to our laboratories, universities, and even archaeological excavations.

Prehistory, for us, is a means through which we can discuss such important topics of daily life as immigration, racism, gender relations, ways of life and food. We hope that programme participants will be able to view certain topics critically, favouring the value of preserving the heritage of our streets and our home countries. Perhaps in that way, they will also respect other ways of life, other ways of thinking and other people around them who come from very different countries and cultures (Smith and Smardz 1999; Martín and Cuenca 2011; Cardona 2012; Monteagudo and Oliveros 2016).

In the end, we think that these often neglected groups have enjoyed science just like thousands of children and teenagers who, without disabilities or economic problems, attend school or visit museums. One of the parents of a boy with Down syndrome told us: 'we're often invited to parties or sports events, but never to cultural activities'.

Our experience and the analysis of the evaluations received suggest that there are some important criteria when disseminating science among these groups:

- Engaging them within their own environment and preparation with educators, families, and psychologists prior to presenting the programme.
- It is better to carry out activities in spaces familiar to them: educational centres, cooperatives, residences, and public spaces.
- Use of plain language in which issues relevant to their problems and interests are involved (e.g. for migrant people to talk about human mobility and the fact that we all have migrant ancestors).
- To be extremely careful with our body language (kinesics) to get and hold the participants' attention.

- Use of sensory tools easy to handle and relate to (p. e. audio-visual and tactile).
- Empower participants by making them understand that everyone can participate in, contribute to, understand, and enjoy science.
- Ask for evaluations and reflect on performance to improve those aspects of the programme that did not work.

We are aware that we should continue to assess ourselves to improve the activities. Although the surveys suggest that we are on the right path, we will continue to work with educational psychologists to achieve better results.

To conclude, learning has been mutual during these years. Thanks to the groups with which we have worked, we have learnt to identify the topics and activities that interest them the most, when they work well and when we do them badly, and when the things we explain or how we explain them are understood, or conversely, boring. We have improved because they all helped us to improve.

We believe that we are achieving our main objective, which is to democratize science. For this, it is necessary to learn and to adapt the contents and tools to different capacities and knowledge. It is also necessary to walk the streets of any city or town, visiting the centres where different groups work or are cared for, and to explain to potential participants, caregivers, and families the benefits that scientific activities can offer: new knowledge; a critical spirit in the face of misleading information; cooperative and collaborative work; personal empowerment; new experiences beyond the family circle or the friends with whom they interact daily, etc.

Our dream is that many other researchers will follow this path, spreading their scientific knowledge and discoveries; to get them out of their laboratories to bring science to people. Only in this way will we achieve a more prepared, critical, and fair society. We know that it is a very ambitious goal, but we believe that it can be achieved one step after the other, thanks to projects like ours and the ones of other colleagues. This requires the involvement of social, cultural, and political agents, and the opportunities that journals with international impacts, such as this one, offer us to present our work.

Notes

1. How many of these people do not usually take part in outreach activities? This is difficult to quantify, as there is no specific record. In terms of the total population, and according to Eurostat data https://ec.europa.eu/eurostat/statistics in 2010, one in every six people in the European Union (i.e. about 80 million people) suffered from some kind of slight or serious disability (Romero 2018). Information for 2017 shows that 36.9 million immigrants originate from outside the European Union. In the same year, citizens of over 65 years of age represented 19.4% of the population (an increase of 0.2% over the previous year and of 2.4% compared with ten years before). Together with the steady decrease in the birth rate and the increase in life expectancy, this shows how the population pyramid is inverting (Giannakouris 2008, Schwarz et al. 2014). Finally, only approximate information is available about the Romani community, as there is no exact quantification as regards ethnic groups. However, the 'Fundación Secretariado Gitano' (https://www.gitanos.org/) notes that in the European Union there must be about 11 million Romani individuals.
2. Further information about our projects, activities and forms of outreach are available on the website https://cienciainclusiva.wordpress.com, and in our articles in different publications and journals (Gibaja et al. 2017, 2018, 2019).

Acknowledgments

This work was supported by the Fundación Española para la Ciencia y la Tecnología (FECYT - Ministerio de Ciencia, Innovación y Universidades) under grants (FCT-13-6944, FCT-16-10722, FCT-17-11972, FCT-18-13183, FCT-19-14670). We would also like to express our sincerest thanks to the institutions that have supported this project: Institució Milà i Fontanals (IMF-CSIC), Área de Prehistoria de la Universitat de Barcelona, Casal de Barri Folch i Torres, Ajuntament de Barcelona, Cooperativa Impulsem, Ajuntament de Sant Martí Sarroca, Adhoc_Cultura, Regirarocs, Arqueolitic, La Ciència al Teu Món, Milá i Fontanals and Consell de Cent secondary schools, Associations Carabutsí and Inter-Acció, Antaviana

Parc Taulí, Parque Arqueológico de las Minas de Gavà and Museu de Ca n'Oliver in Cerdanyola del Vallès and the projects ERC-StG ZooMWest Grant 716298, *Expansión y desarrollo del neolítico en el Mediterráneo central: tecnología y producción de alimentos en el asentamiento lacustre de La Marmotta (Roma, Italia) (201818008)* and *La difusión del neolítico en el Mediterráneo centro-occidental: agricultura, innovaciones tecnológicas y carbono 14 (HAR2016-75201-P)*. Some information and discoveries generated during the research of these projects have been used in certain activities or have served to create new teaching tools. We want to mention the excellent work and kindness offered by the team of archaeologists in the excavation at Guixeres de Vilobí. Finally, thanks to Peter Smith for the translation of this article, as well as the editors of this journal and the two anonymous referees. Without a doubt, this article is much better thanks to their critical assessments.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Fundación Española para la Ciencia y la Tecnología (FECYT - Ministerio de Ciencia, Innovación y Universidades) under grants (FCT-13-6944, FCT-16-10722, FCT-17-11972, FCT-18-13183, FCT-19-14670).

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