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Museums as spaces and times for learning and social participation

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A museum is valued according to its collections, communication and knowledge exchange with visitors (Primo, 1999). Museums should be in dialogue with the public, contributing to their development (Skramstad, 2004) and collective memory (Wertsch, 2004). Social interactions and working in participants' zone of proximal development (Vygotsky, 1934/1962) play an important role in non-formal learning opportunities that take place at museums. The National Museum of Natural History and Science (Lisbon University) offers weekly holiday programmes for children and teenagers, aiming at developing scientific literacy in intercultural and inclusive spaces and times, facilitating knowledge appropriation and social participation. We studied these programmes, assuming an interpretive approach (Denzin, 2002) and developing an intrinsic case study (Stake, 1995). The main participants were these children and teenagers, their parents, and museum educational agents. Data collecting instruments included observation, interviews, questionnaires, children and teenagers' protocols and tasks inspired in projective techniques. Data treatment and analysis was based on a narrative content analysis (Clandinin & Connelly, 1998) from which inductive categories emerged (Hamido & César, 2009). Some examples illuminate participants' expectancies, their engagement in activities, and the contributions of social interactions and non-formal education to the development of scientific literacy.

Keywords: museum, scientific literacy, non-formal learning settings, social interactions, zone of proximal development, participation

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Contextualization

Children and teenagers' school holidays are much larger than adults' holidays, raising difficulties for parents. Grandparents or other relatives are not always available to stay with them. Families have to find somewhere to leave them, especially during the summer. It is not just about occupying their time, but about promoting their development of abilities and competences, knowledge appropriation and literacy, particularly scientific literacy. That is why holiday programmes, offered by a variety of institutions, have emerged. Museums are aware of their publics' needs and aim to act towards promoting social development (Moutinho, 2007, 2010; Santos 1996). They offer exhibitions and suggest diversified tasks through programmes especially designed for the school public, during the holidays.

In Portugal the educational services of the museums, that design these programmes for target-publics, began in 1953 (Cavaco, 2002; Leal, 2007). In 1969 an innovative holiday programme was created, aimed at 14–20-year-old teenagers (Leal, 2007). Since then, the offers of museums have grown and diversified. The National Museum of Natural History and Science (*Museu Nacional de História Natural e da Ciência*), where this study took place, created educational services in the early 1990s. The programme *Holidays in the Museum* began in 2002, when there were still two museums — the Natural History Museum (*Museu de História Natural*) and the Science Museum (*Museu da Ciência*) —, a situation that remained until recently, when these museums merged into one. These programmes have been very positively assessed by the public, for children and teenagers repeat the programme in consecutive years, and some participate in more than one week per year. This means that, to better respond to the target-public's needs, this programme suggests different tasks each week, thus allowing whoever repeats it to develop different activities. This diversity is considered an asset.

Theoretical background

Museums and literacy

Museums are institutions that keep, communicate and investigate collective memories and History. History provides access to representations of the past, that is, to interpretations about that past, by sharing collective memories (Wertsch, 2004). Through the choices they make regarding their organization and the collections made available, museums grant several entities and individuals a voice(s) (Wertsch, 1991). They enable dialogue between the collections and the public, choosing how this mediation may be facilitated (Wertsch, 1985, 2004).

Collective memory illustrates the existence of different social and cultural groups (Wertsch, 2004; Wertsch, del Rio, & Alvarez, 1995). It tends to focus on the stability and continuity of a group, which often resists recognizing it has changed. Many times we forget that one of the features of human beings is that they adapt to new challenges. This illuminates the importance of social interactions with those who are different, who participate in other cultures (César, 2013a, 2013b). Just like History, collective memory also changes over time. This change derives from the need to create a usable past, which varies with time and space, that is, just as in the case of learning, collective memory is a situated phenomenon (Lave & Wenger,

1991; Vygotsky, 1931/1985). What constitutes a usable past, in a given socio-cultural context, is different from whatever happens in another socio-cultural context (Wertsch, 2004).

Through their collection, exhibitions and events, museums communicate with the surrounding population, promoting their development and their literacy. The museum is no longer directed only towards the school public, but to the general public, with its inherent diversity (Dodd, 1999). Using objects of the collections of museums is advantageous, facilitating the visitor's motivation for non-formal learning. People are fascinated by instruments and artefacts (McRainey & Russick, 2010; Russick, 2010). When they are motivated through objects, they respond with enthusiasm and questions arise (Shuh, 1999). Another advantage of using objects in teaching and learning processes is that they are not specific for certain ages, level of education or development. Each object can be used in a group of children, teenagers or adults, although the approach, questioning and general discussion are different (Dias, 2014). Each group observes and questions according to its experiences and appropriate knowledge. Cultural artefacts help to document each person's life trajectories of participation (César, 2013a, 2013b; Vygotsky, 1934/1962), as well as ancestors' experiences. But that is also why they help to have a better understanding of the present and to be more capable of predicting the future. They stimulate the development of abilities and competences, and call attention to the preservation of objects and to a critical observation of the world, including the cultural differences found in each era and place.

With the development of information and communication technologies (ICT), other spaces/times of knowledge were created. Currently, besides the school and museums, business companies, the family space and the social space have also become educational. Increasingly more people study at home, thanks to the possibility of accessing cyberspace, thus allowing distance learning. Knowledge society offers multiple opportunities for formal, non-formal and informal learning (Dias, 2014). This brings huge consequences for the school, for the teacher and for education, in general. Teaching to think, knowing how to research and communicate, developing logical reasoning, carrying out syntheses and theoretical elaborations, organizing and monitoring work, being autonomous and critical, being creative, or knowing how to articulate knowledge and practice, have all become essential issues (Gadotti, 2005).

Learning experiences must be varied, whether in a formal or a non-formal context (Gadotti, 2005), namely those occurring during the holidays and in a museological context, such as the programme *Holidays in the Museum* (Dias, 2014). Today, on a global scale, there are concerns regarding the population's literacy level, namely regarding functional literacy (Benavente et al., 1996). This has led to the inclusion of science and technology in school curricula, and to seek other contexts of non-formal learning. For example, visits and hands-on exhibitions are encouraged in museums. These interactive exhibitions, in comfortable and rather informal scenarios, are an invitation to play and to interact with other visitors, thus seducing teenagers and adults. Visitors are invited to experiment, to produce hypotheses and test them, rejecting some and accepting others (Dias, 2014). The activities are aesthetically seductive and must promote a reflection about scientific content and explore fundamental aspects of the forms of social action (Feber, 1990). In this

sense, some studies show that exhibitions with simple interpretation and plenty of information produce few learning opportunities for most visitors.

Learning, social interactions and nature of the tasks

Wertsch and his associates (1995) claim that the historical-cultural perspective of learning is interested in understanding the relations established between human actions and cultures. According to Renshaw (2004), to assume the historical-cultural nature of learning means that education is not just about theoretical and technical knowledge. It also deals with the analysis of the conditions and cultural practices, with its historical background. Thus, learning should comprise this historical-cultural dimension of how knowledge was produced.

When planning pedagogical tasks, in a context of formal and non-formal education, diversified tasks regarding their nature must be designed: project work, problems, lab and experimental tasks, essays and portfolios, among others. Participants must develop activities that they cannot carry out autonomously, for which they need social interactions between peers, thus resorting to collaborative work (César, 2008, 2009, 2013a) — in other words, working in their zone of proximal development (ZPD). For Vygostky (1934/1962), this enables the promotion of development. Studies carried out by César (2008, 2009, 2013a) show that both more competent peers and less competent peers make progress, that is, that social interactions and collaborative work have more potential than that originally predicted by Vygotsky (1934/1962). From a pedagogical viewpoint this aspect is essential, particularly when tasks are designed based on social interactions between peers and collaborative work. It would not be legitimate to resort to this form of work on a daily basis if only the less competent peers made progress. Providing activities which rely on collaboration and interactions between parents and children, grandparents and grandchildren, siblings or peers, in a context of non-formal education, such as in museums, is a way of working in each one's ZPD and, therefore, of promoting the development of all the participants (Dias, 2014).

If teachers (as regards learning in formal contexts) or those in charge of the educational activities in museums (in non-formal contexts) design tasks that allow different children or teenagers to work in each of their ZPDs, alternating as the more competent peer, they are facilitating the maturation of certain abilities and competences which may then be used autonomously, that is, they may become part of the actual level of development (César, 2009, 2013a; Dias, 2014; Vygotsky, 1934/1962). Thus, through learning situations, the actions of the different educational agents may contribute to the development of an individual. But they may also create barriers, or even block this development. Therefore, it is vital to design education processes that fit the target-publics and according to well-chosen epistemological principles (César, 2013a).

Regarding the child's development, Vygotsky (1934/1962) claims that embryological development cannot be considered at the same level as post-natal development, as the child is a social being. Therefore, he underlines two distinct types of development that are complementary: natural and cultural development. The development of thought occurs from the social to the individual (Vygotsky, 1931/1985). What happens first, in the social sphere, will later be transformed, through a pro-

cess of internalization, into intra-personal abilities and competences that the individual can use autonomously and individually, that is, that are part of the actual level of development. Similarly, César (2013a, 2013b) conceives that empowerment mechanisms are also developed at first in the social sphere and only after that at an individual level. This means that being confronted with inter-empowerment mechanisms, promoted by parents, teachers, or other more powerful persons, is an essential step to become able to internalize those mechanisms, transforming them into intra-empowerment mechanisms. Empowerment plays an essential role in learning.

Method

The problem that gave rise to this study is children and teenagers' low scientific literacy in Portugal (Martin et al., 1997; OCDE, 2006). The main goal of this research is to study the influence of leisure scientific activities, developed in museums during the school holidays, in children and teenagers' interests towards scientific issues and in the promotion of their scientific literacy. We focus on the programme *Holidays in the Museum* developed in the National Museum of Natural History and Science. We address one of the research questions: How did this programme contribute to the promotion of participants' scientific literacy?

The programme *Holidays in the Museum* uses a leisurely approach to the domains of science of this museum: Astronomy, Biology, Botany, Chemistry, Physics, Geology, Mathematics, and Zoology. It is a weekly programme and every week it has a merging theme. In 2009, when we collected the data, the themes were: Air, Water, Fire and Earth. At the beginning of each week the programme starts with a new group. It is aimed at children and teenagers, aged between four and 13. These are divided into three age groups: Small Group — four and five-year-olds; Medium Group — six to eight-year-olds; and Large Group — nine to 13-year-olds. Each group is accompanied by two monitors. In specific situations, expert monitors in some field or activity collaborate. Each day includes scientific activities and free moments, to play and be autonomous, which are shared by the three groups in the Botanical Garden.

We assume an interpretive paradigm (Denzin, 2002) and developed an intrinsic case study (Stake, 1995). We analysed two Small, Medium and Large groups, totalling six groups. The participants are these children and teenagers, their parents, monitors, the researcher and other staff. Data collecting instruments include observation (recorded on the monitors' and researcher's diary, in audio recordings and in photos), interviews (children and teenagers chosen as privileged informers; respective father or mother), informal conversations, tasks inspired in projective techniques (TIPT), that provide access to feelings, expectancies and motivations that cannot be observed in instruments of another type (Machado & César, 2008, 2013), children and teenagers' protocols and documents.

With respect to data collection procedures, each week began with participants carrying out a task inspired in projective techniques (TIPT 1). Through a drawing or in writing, each child or teenager completed the sentence: "This week is going to be …". The younger ones, who could not read, would draw and have their instructions said orally to them by the researcher or monitor. On the last day of activities

they carried out another task inspired in projective techniques (TIPT 2). Through a drawing or in writing, they completed the sentence: "This week was…". The procedure for the Small Group was similar to that of the TIPT 1. During each week of activities observations were carried out and the work the children and teenagers produced was collected and constitutes their protocols. At the end of the week we interviewed two children and teenagers from each group and their father or mother. Small Group children had group interviews (four children and the researcher). Informal conversations took place throughout the week and sometimes even later on, when there were unexpected meetings between participants. Data treatment and analysis procedures were based on a narrative content analysis (Clandinin & Connelly, 1998), from which inductive categories emerged (Hamido & César, 2009). Writing also assumes a narrative style, giving the different participants a voice. It traces participants' life trajectories of participation, particularly in this programme (César, 2013a; Dias, 2014). We used fictional names (children and teenagers) and acronyms (monitors) to protect participants' anonymity. In the transcripts we use … after a word for a small pause in the account (less than 3 seconds), and (…) for longer pauses.

Guba and Lincoln (1998) consider that the triangulation of theories, sources (informers), instruments to collect data and researchers are quality criteria in the interpretive research paradigm. We used them all. We triangulated socio-museological theories (Moutinho, 2007, 2010; Santos 1996) with the historical-cultural perspective (Vygotsky, 1934/1962) and the situated learning theory (Lave & Wenger, 1991). We considered different participants (children and teenagers, their parents, monitors, other staff from the museums and the researcher) so that information would be collected from different sources, allowing us to confront them. The instruments used to collect data were also diverse so that participants could express themselves through different languages — oral, written, drawings, or other forms of art. When research uses different instruments, some are more and others less structured. Some collect data in a direct form (e.g., interviews, informal conversations) and others in indirect forms (e.g., questionnaires, TIPTs). Some are more formal and others more informal. Thus, the participants' diversity is respected and all of them have the possibility to express themselves through the instruments and languages they prefer. Last but not least, sharing part of the data analysis and interpretations with other researchers from our research team, who began working together in the *Interaction and Knowledge* (IK) project, allowed us to expand interpretations, producing a more in-depth analysis. As César (2013a) states, the quality of research is a serious issue and triangulation is a way of achieving high quality research in human and social sciences, particularly when social interactions play a major role.

Results

Activities began on Monday, at 9 a.m., with a game to introduce all the children, teenagers, monitors, the researcher and parents who could be present. Next there was a brief yoga session, in which the parents also participated. Then, without the parents, the children and teenagers had a light meal and participated in an activity on that week's theme, such as a visit to the Botanical Garden to discuss how

important water is to plants. They had lunch and played freely in the garden, all three groups together. In the afternoon they had another specific scientific activity for each age group. Next a light meal was served and they played freely until their parents arrived. The following days this was repeated.

The activities developed by the children and teenagers were about the various domains of science, in a leisurely but scientifically strict manner. We used the permanent and temporary exhibitions, the Botanical Garden and a butterfly greenhouse. During the last two weekdays the activities were related to Visual Arts, for the Farewell Party was prepared and took place on the last day. Scenarios and props were built and, among other things, it was decided what to present to the families. This party took place on Fridays, around 5 p.m., and everyone participated. It was a small play or an exhibition of the work that had been carried out. It intended to show the families what themes were dealt with during the week.

Figure 1. Guided visit to the Botanical Garden. Observation of the characteristics of cacti that live in habitats where water is scarce.

Both observation, recorded in photos or in the diaries, informal conversations and interviews illuminate that the children and teenagers engaged well in the proposed tasks, paying attention and participating, as we can see in Figure 1. This is a visit to the Botanical Garden where just one child, at the far left of the photo, is not following the monitor's explanation. As it is a garden with other visitors, animals and many plants, sometimes something caught a child's attention for a while. But then the child would go back to participating fully in the activities that group was carrying out.

Five-year-old Marco had already participated in the programme *Holidays in the Museum*. He was a regular visitor of the museum, where he went with his family. During this programme he appropriated contents regarding the protection mecha-

nisms of plants against fire, managing to mobilize them in informal conversation (Talk 14).

> 12 Marco (M) — And I also really liked it… When you go to the dinosaurs before… there's these fossils on display! And I also liked that a lot.
> 13 Researcher (R) — And did you learn anything this week? What?
> 14 M — [Pause] Ah… there's some trees that need fire to grow. Some trees let their lower branches fall. The branches start burning and… They fell… and they leave the top ones. [Pause] (Marco, Group Interview, p. 1)

In this interview excerpt he states he really liked to see the fossil displays. He knows the space well, because he clearly explains where the display counter is. You can tell that he is a regular visitor and that he visits the museum with pleasure and attention, acting as a legitimate participant (César, 2013a; Lave & Wenger, 1991).

There are several reports that illustrate weeks in which the children and teenagers felt happy, developed abilities and competences, appropriated knowledge which they later managed to mobilize in other contexts, such as the family one. One Mother of two children, aged five and eight, who had never spent holidays away from their family context and did not know the museums, illuminates this aspect:

> 16 Jonas' Mother (JM) — One thing I found very funny was that, on the last day, Friday, when I came to pick them up after the presentation, they made a point of taking me to the Botanical Garden, to the part of the Garden itself, and showing me many things: they wanted to show me the dragon tree — they were fascinated with the dragon tree -; then they wanted to pick up dragon seeds that were on the ground, … the little fruits; I'm not sure if I'm saying something wrong. That little orange thing that falls — it looks to me like it's the fruit and it has a seed inside. They wanted to catch it to take it home because they wanted to plant it and also have dragon trees at home. [All smile] We warned them, me and Grandpa, that their failure rate would probably be very big [Smiles], so each of them caught about ten little seeds. Then they wanted to show me the giant rubber tree. Then… I'd never seen them so interested in trees! (Jonas' Mother, Interview, p. 4)

This account not only reflects the children's enthusiasm when they are showing their Mother the Botanical Garden, which she did not know, and the trees that most impressed them. It also illustrates the knowledge they appropriated and managed to mobilize in an informal context of an autonomous family visit. This Mother learned scientific knowledge with them, so her sons acted as more competent peers. Their enthusiasm was such that they insisted on taking various seeds and trying to plant them at home. We would like to stress how they take on a responsible citizenship: they pick fruits and seeds off the ground, as was suggested on their visits to the Botanical Garden. It also illuminates the arousal of their scientific curiosity, as well as their satisfaction and pleasure in learning and in wanting to experiment, namely by taking seeds to plant a dragon tree.

Baltazar, 12 years old, was participating in the Large Group, formed by children and teenagers who frequently establish links between their experiences in muse-

ums and what they learn in a formal education context, that is, in school. The visit to an exhibition in a museum may constitute a way of illuminating different contents that have already been discussed in school subjects, or of observing a practical application of scientific contents. Some teenagers are already starting to think about what they would like to be, like Baltazar, who was particularly interested in the Physics Exhibition.

1 Researcher (R) — What did you like the most this week?
2 Baltazar (B) — The Physics Exhibition.
3 R — Why?
4 B — Because it has things I like and it's what I want to follow. I want to study Physics (Baltazar, Interview, p. 1)

After visiting the Physics Exhibition they developed an electronic activity, to put into practice basic Electromagnetism concepts discussed in the Exhibition. From the analysis of simple electrical and electronic circuits, the children and teenagers were meant to understand how electric current is transmitted. After the first explanations, the construction of a simple electronic circuit was proposed. Baltazar mentioned that he understood the circuit and that he could repeat this construction without any help. He stressed that he learned contents about the production of electricity, which is an empirical proof of how engaged he was and that he developed scientific literacy.

41 Researcher (R) — And now in the particular case of the electronic activity, which we did for the first time… What did you think?
42 Baltazar (B) — It was funny… I didn't know that with magnets and copper wires you made electricity! And with loads of wires you made games and… you could light up headlights with paper.
43 R — And did you understand how the circuit became for the LED to light up?
44 B — Yes.
45 R — Could you do it again?
46 B — Yes… I could.
47 R — And do you think it was positive? Or rather, what do you think we can improve there, in the Electronics part?
48 B — Maybe spending a bit more time there.
49 R — You think it was little time.
50 B — Yes.
51 R — And you learned, you understood?
52 B — Yeah! (Baltazar, Interview, p. 3)

Illustrating Baltazar's pleasure in this activity, which he describes as being "funny" (Talk 42), is his sole suggestion: to spend more time developing it (Talk 48). So, not only does he claim that he is able of producing one of those circuits again and on his own, but he wishes he had spent more time on similar activities. This shows an interest and an appetite to learn more about Electronics.

Anita, 13 years old, had never participated in the programme *Holidays in the Museum*. In one of the activities the participants had to build a diorama of an en-

dangered sea animal. She did some research and chose the turtle. She built it with sponge, painted in black and green, hanging by a nylon thread and glued to the top of the box. For her background she drew a blue sea with an octopus with eight tentacles, as well as several small orange fish (see Figure 2). On top of the sea, in the back, there is a yellow-sanded beach with a palm tree and a vegetated area with various small houses and a yellow sun. The sea bottom was represented with dark sand, glued to the box bottom, and a black rock, built from a piece of crumpled, painted paper, besides a dry plant, glued to the box bottom and representing a water plant. Her drawing reveals much scientific rigour, because turtles live in warm waters, which are typical of tropical climates, which justifies the presence of palm trees.

Figure 2. Diorama about the turtle built by Anita, 13 years old.

These works were opportunities to experiment Visual Arts techniques, using low cost materials and others corresponding to garbage, alongside the concern of representing something with scientific rigour. This means learning experiences from the Visual Arts joined others from Botany, Zoology and Geography, illustrating the advantage of proposing interdisciplinary tasks that promote literacy, creativity, observation and fine motor skills. Thus, they combine resorting to intellectual competences and manual skills which, as Vygotsky (1934/1962) stated, are those that most favour children and teenagers' socio-cognitive and emotional development. The final products (dioramas) illuminate the participants' effort, and their appropriation and mobilization of scientific contents, of painting, drawing and collaging techniques.

Seven-year-old Matilde drew in her notebook a big herbivorous dinosaur, painted in green and orange, looking happy, next to a lake, and a dragonfly flying (see Figure 3). During the activities developed by the children and teenagers, it was mentioned that insects emerged on Earth before the time of the dinosaurs and that

dragonflies live in humid atmospheres, next to lakes. Matilde's drawing shows a possible situation, thus revealing knowledge appropriation and the mobilization of competences in new situations, like the production of her field book.

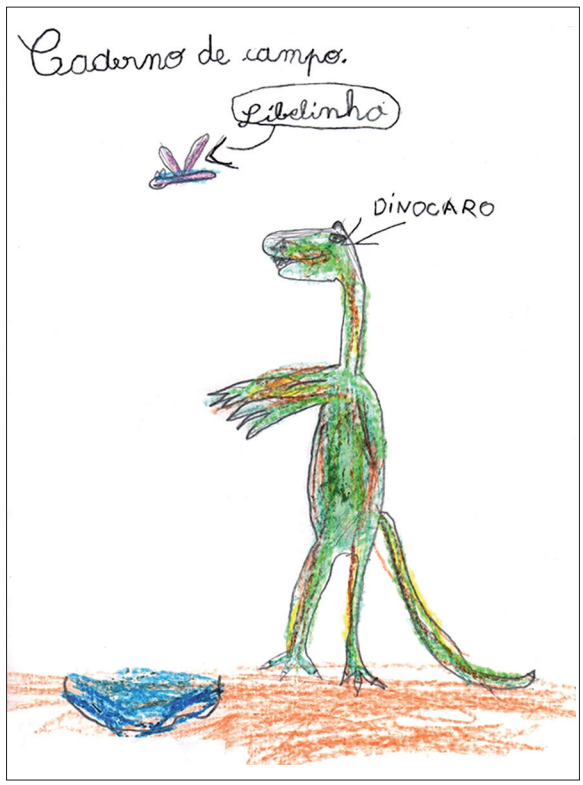

Figure 3. 7-year-old Matilde's field book.

In some children, the curiosity aroused during the day continued at home, as seven-year-old Paulo's Mother mentions.

> 29 Researcher (R) — And at home, did Paulo try to do research? Was he curious about doing research?
> 30 Paulo's Mother (PM) — He fetched his books on dinosaurs and read them. And one he had about sharks and the aquatic environment and so on. This morning, for example, he was reading, alone. I even told him off. I told him off, not because he was reading but because we had to rush, so… In terms of research that's what I noticed … (Paulo's Mother, Interview, p. 5)

This episode illuminates autonomy in searching for information and in appropriating knowledge, when doing research on his own, without his parents' support. It also illustrates the ability to concentrate, for he was so interested he did not realize he was late. His curiosity regarding something he had heard the day before also illustrates wanting to know more. It corresponds to pro-active forms of action that are at the base of research and of the advancement of scientific knowledge.

Lunch was also an opportunity to practice what was explained: the importance of a varied diet, including vegetables and fruit, and low on fat and sugar, for our health. Even if they did not like to, they all ate a bit of soup and salad besides the other foods.

> 2 Camila's Mother (CM) — (…) on Tuesday she ate a piece [of tomato], then on the other days she really began to eat tomato. And now, this was a problem that was solved there and that was that. Camila is already eating tomato! Which is great, because we know tomato is an antioxidant, it's very good to avoid cancers… and that was a plus.
> 3 Researcher (R) — She's already eating tomato! And does she like it!? Or doesn't she?
> 4 CM — She does. (Camila's Mother, Interview, p. 1)

Six-year-old Camila started eating and liking tomato during this programme, as her Mother reports. This illuminates the importance of this manner of managing the meals in some children's change of eating habits, broadening the vegetables that they liked. Thus, it also contributed to promote scientific literacy.

Final remarks

The analysis of the protocols, interviews, informal conversations, TIPTs and the observation records show that the children and teenagers appropriated knowledge they managed to mobilize when accomplishing the various activities they developed, such as when they drew or talked at home, with relatives and friends. They included several scientific details, discussed during the week, in their drawings, other work and conversations. The materials produced by the children and teenagers, while carrying out the activities and when they were preparing the Farewell Party, are empirical proof of the promotion of scientific literacy.

The parents' accounts illuminate that in a family context the children and teenagers mobilized knowledge they had appropriated in a museological context. They talked about scientific details regarding themes approached in the activities they had done, illustrating the appropriation and mobilization of scientific contents. They showed their parents the museums and the Botanical Garden, telling them about the specificities of certain plants. They began to eat certain vegetables, showing they had changed their eating habits to more healthy ones. They did research about something to do with the week's themes, revealing autonomy, engagement in the activities and motivation to know more and, therefore, to develop literacy. These examples reveal the mobilization of knowledge, abilities and competences, as well as the transitions that took place, between contexts. This constitutes an essential aspect of learning that allows it to be used in different problems and situations.

The appropriated knowledge did not benefit only these children and teenagers. It was shared with families, friends or schoolmates, so they acted as literacy propagators. Thus, they developed agency and became legitimate participants in different contexts, scenarios and situations. Therefore, the effects extended beyond the week and the museum. This programme contributed to their autonomy and education for sustainability.

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References

Benavente, A., Rosa, A., F. Costa., A., & Ávila, P. (1996). *A literacia em Portugal: Resultados de uma pesquisa extensiva e monográfica* [Literacy in Portugal: Results from an extensive and monographic research]. Lisboa: Fundação Calouste Gulbenkian.

Cavaco, G. (2002). *Um museu na cidade: Representações sociais de uma unidade museológica em transformação no centro de Lisboa* [A museum in the city: Social representations of a museological unit in the centre of Lisbon] (Master thesis, unpublished document). Departamento de Museologia da Universidade Lusófona de Humanidades e Tecnologias, Lisboa.

César, M. (2008). Come away with me: Statistics learning through collaborative work. In M. Niss, & E. Emborg (Eds.), *ICME 10–10th international congress on mathematical education (2004) proceedings* (pp. 1–19). Copenhagen: Roskilde University.

César, M. (2009). Listening to different voices: Collaborative work in multicultural maths classes. In M. César, & K. Kumpulainen (Eds.), *Social interactions in multicultural settings* (pp. 203–233). Rotterdam: Sense Publishers.

César, M. (2013a). Collaborative work, dialogical self and inter-/intra-empowerment mechanisms: (Re)constructing life trajectories of participation. In M.B. Ligorio, & M. César (Eds.), *Interplays between dialogical learning and dialogical self* (pp. 151–192). Charlotte, NC: Information Age Publishing (IAP).

César, M. (2013b). Cultural diversity and regulatory dynamics of participation between schools and families. In P. Marsico, K. Komatzu, & A. Iannaccone (Eds.), *Crossing boundaries: Intercontextual dynamics between family and school* (pp. 35–81). Charlotte, NC: Information Age Publishing (IAP).

Clandinin, D. J., & Connelly, F. M. (1998). Personal experience methods. In N.K. Denzin, & Y.S. Lincoln (Eds.), *Collecting and interpreting qualitative materials* (pp. 150–178). Thousand Oaks, CA: Sage Publications.

Denzin, N. (2002). The interpretative process. In A. Haberman, & M. Mieles (Eds.), *The qualitative researchers companion* (pp. 349–366). Thousand Oaks, CA: Sage Publications.

Dias, A. (2014). *O museu como espaço de aprendizagem: Contributos para a promoção da literacia científica* [The museum as a learning space: Contributions to the promotion of literacy] (PhD thesis, unpublished document). Lisboa: Departamento de Museologia da Universidade Lusófona de Humanidades e Tecnologias.

Dodd, J. (1999). Whose museum is it anyway? Museum education and the community. In E. Hooper-Greenhill (Ed.), *The educational role of the museum* (pp. 131–133). London, UK: Routledge.

Feber, S. (1990). New approaches to science: In the museum or out with the museum?. In T. Ambrose (Ed.), *Education in museums, museums in education* (pp. 85-94). Edinburgh, UK: Scottish Museum Council.

Gadotti, M. (2005). Informação, conhecimento e sociedade em rede: Que potencialidades? [Information, knowledge and network society: Which potentialities?]. *Educação, Sociedade & Culturas*, *23*, 43–57.

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. In C. Geertz (Ed.), *The interpretation of cultures. Selected essays by Clifford Geertz* (pp. 3–30). New York, NY: Basic Books.

Guba, E. G., & Lincoln, Y. S. (1998). Competing paradigms in qualitative research. In N.K. Denzin, & Y. S. Lincoln (Eds.), *The landscape of qualitative research: Theories and issues* (pp. 195–220). Thousand Oaks, CA: Sage Publications.

Hamido, G., & César, M. (2009). Surviving within complexity: A meta-systemic approach to research on social interactions in formal educational scenarios. In K. Kumpulainen, C. Hmelo-Silver, & M. César (Eds.), *Investigating classroom interaction: Methodologies in action* (pp. 229–262). Rotterdam: Sense Publishers.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press. doi: 10.1017/CBO9780511815355

Leal, V. (2007). *As artes plásticas como atividade lúdica no espaço museal. Estudo de caso: "Manhãs no Museu", realizadas no Museu de Arte Sacra, no Funchal* [The visual arts as a leisure activity in the museum. Case study: 'Mornings in the Museum' at the Sacred Art Museum] (Master thesis, unpublished document). Lisboa: Departamento de Museologia da Universidade Lusófona de Humanidades e Tecnologias.

Machado, R., & César, M. (2008). Broccoli and mathematics: Students' social representations about mathematics. In J. F. Matos, P. Valero, & K. Yasukawa (Eds.), *Proceedings of the 5th international mathematics education and society conference* (vol. 2, pp. 376–385). Lisboa: Centro de Investigação em Educação da Faculdade de Ciências da Universidade de Lisboa & Department of Education, Learning and Philosophy, Aalborg University.

Machado, R., & César, M. (2013). Diversity, dialogism and mathematics learning: Social representations in action. In B. Ubuz, Ç. Haser, & M. A. Mariotti (Eds.), *Proceedings of the Eighth Congress of the European Society for Research in Mathematics Education* (pp. 1764–1773). Ankara: Middle East Technical University. Retrieved from: http://www.mathematik.uni-dortmund.de/~erme/doc/CERME8/CERME8_2013_Proceedings.pdf

Martin, M., Mullis, I., Beaton, A., Gonzalez, E., Smith, T., & Kelly, D. (1997). *Science achievement in the primary school years: IES's third international mathematics and sciences study (TIMSS).* Boston, MA: Center for the Study of Testing, Evaluation and Educational Policy, Boston College. Retrieved from http://timss.bc.edu/timss1995i/TIMSSPDF/astimss.pdf

McRainey, D., & Russick, J. (2010). *Connecting kids to history with museums exhibitions.* Walnut Creek, CA: Left Coast Press.

Moutinho, M. (2007). Museology: New focuses/new challenges. *Cadernos de Sociomuseologia, 27*, 7–9.

Moutinho, M. (2010). Evolving definition of sociomuseology proposal for reflection. *Cadernos de Sociomuseologia, 38*, 27–31.

Organização para a Cooperação e Desenvolvimento Económicos (OCDE) (2006). *Competências em ciências para o mundo de amanhã. Volume 1: Análise*. [Science competencies for tomorrow's world. Volume 1: Analysis]. S. Paulo: Editora Moderna L.^{da}. Retrieved from: http://www.oecdbookshop.org/oecd/display.asp?CID=&LANG=en&SF1=DI&ST1=5KZN0F74M4F3

Renshaw, P. (2004). Dialogic learning, teaching and instruction: Theoretical roots and analytical frameworks. In J. van der Linden, & P. Renshaw (Eds.), *Dialogic learning: Shifting perspectives to learning, instruction, and teaching* (pp. 1–15). Dordrecht: Kluwer Academic Publishers. doi: 10.1007/1-4020-1931-9_1

Russick, J. (2010). Making history interactive. In D.L. McRainey, & J. Russick (Eds.), *Connecting kids to history with museums exhibitions* (pp. 219–239). Walnut Creek, CA: Left Coast Press.

Santos, M. C. (1996). Uma abordagem museológica do contexto urbano [A museological approach to the urban context]. *Cadernos de Sociomuseologia, 5*, 40–65.

Shuh, J. H. (1999). Teaching yourself to teach with objects. In E. Hooper-Greenhill (Ed.), *The educational role of the museum* (pp. 80–91). London, UK: Routledge.

Stake, R. (1995). *The art of case study research*. Thousands Oaks, CA: Sage Publications.

Vygotsky, L. S. (1931/1985). Les bases épistémologiques de la psychologique [The epistemological foundations of psychology] (Catherine Haus trans.). In B. Schneuwly, & J.-P. Bronckart (Eds.), *Vygotsky aujourd'hui* [Vygotsky today] (pp. 25–38). Neuchâtel et Paris: Delachaux et Niestlé. (First published 1931)

Vygotsky, L. S. (1934/1962). *Thought and language* (Myshlenie I rech', Trans.). Cambridge, MA: MIT Press. (First published 1934)

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1991). *Voices of mind. A sociocultural approach to mediated action*. Cambridge, MA: Harvard University Press.

Wertsch, J. V. (2004). *Voices of collective remembering*. New York, NY: Cambridge University Press.

Wertsch, J. V., del Rio, P., & Alvarez, A. (Eds.) (1995). *Sociocultural studies of mind.* Cambridge, UK: Cambridge University Press. doi: 10.1017/CBO9781139174299

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