

Practical aspects of a museum visit

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Introduction

In order to discuss the educational value of a museum visit, it is important to begin from acknowledging the significance of the relationship between school and museum, both of which play an important role in young people's education. The museum visit should be seen in the context of an extensive and lasting relationship between the school and the museum rather than as a random excursion of the class. The present chapter analyses the practical aspects of such a visit providing guidelines for maximising its learning potential.

In the context of the SMEC project, the co-operation between schools and museums – based on the development of common educational projects – led to a long-term contact using the visit as an important tool for the teaching and learning of sciences. During the visits of the schools, the teachers felt "authorised to enter the museum, *the temple of culture*, from which they felt excluded and which strongly intimidated them".¹ On the other hand, thanks to the relationship developed with the teachers, the project offered the opportunity to the museum to enrich its educational offer and improve the relationship with the pupils.

The two institutions adopt different methodologies and address diverse competencies as well as knowledge. In consequence, the need for mutual understanding derives from the range of interpretations that we can attribute to the term 'education' – in terms of methodology of knowledge acquisition (deductive-inductive, formal-informal, top-down) as well as in terms of contents to transmit (notions, behaviours, subject-knowledge, critical skills).

Mutual understanding of the ways the two institutions work allows the identification of the respective needs and expectations. Moreover it permits a common development of educational projects and a consistent organisation of the visit to the museum. This "new" relationship offers the teachers and museum educators the opportunity to clarify the respective roles, avoiding any misunderstandings.

During the visit the teacher normally entrusts her pupils to another education expert, becoming herself an observer. However, even in this role she can contribute by being present in the important stages of the visit and, later on, by discussing the subjects of the visit in class. It is important to keep in mind this double role of the teacher: educator at school and observer at the museum, for this twofold position can sometimes be uncomfortable and can disturb the visit experience of the pupils.

Today the museum presents itself as a reference and support to the development of scientific knowledge of teachers. It can help to improve the understanding of sciences acting on two different sides: the professional training of teachers and the stimulation of pupils' interest in sciences. The effectiveness of the visit can be strengthened and integrated in the classroom where its contents can be structured and integrated with school curricula requirements.

In talking about the success of a visit we are not only referring to the scientific aspects of its contents. We should also consider its emotional sides, the audience's participation and the need of a general shaping of the individual. The visit to the museum is a moment of intellectual learning where we develop different transverse abilities and competencies. Moreover it is an experience that can help the pupil to acquire a critical and productive behaviour and to create mental structures that will enable her not only to learn but also to re-elaborate notions (two different approaches to knowledge of the museum and of the school). Piaget maintains that "education is not only instruction but also a formative condition necessary to the natural development itself". It should not concentrate only on the acquisition of knowledge but also on "shaping mental structures" (Piaget 1975). In this sense education becomes a tool with which to construct the conscience and the personality of the individual (Hooper Greenhill 1992).

Research studies confirm that individuals learn more successfully when they have the desire to learn: motivation is an essential factor in both emotional and cognitive learning. The visit to the museum can be considered a valid contribution to increase the interest of pupils and to stimulate their curiosity and observation skills.

There are no fixed rules to be given to the museum educator on how to conduct the visit: on the contrary it would probably be preferable not to have just one single method but to lead the group in listening to its needs. Trying to use different methods and strategies enables the museum educator to reach a larger number of pupils, to adapt to individual intelligence forms (Gardner 1993) and learning styles.

¹ These are the exact words of an Italian teacher participating to the project.

Feyman (2000, 37), talking about class lectures, writes:

"Which is the best way to conduct a lesson? Is it better to begin by the history of science or by its applications? My advice is to avoid theories; to sail by sight, to be chaotic and to mingle a bit of everything, to alternate various techniques so as to catch on the way different students with different baits. [...] If you can avoid them yawning all at the same time you might be able to make it."

It is as if the museum educator had a text guideline, just like an actor. At each visit with the pupils she then creates an entirely new and unique script. This continuous adaptation effort and the free dynamic of the visit can sometimes create difficulties for teachers. However trusting the museum staff and preparing the visit in advance can help avoiding this type of embarrassment. The collaboration between school and museum, aiming at the preparation of the visit, should not only focus on the contents but also on the way pupils and teachers will experience the activity. It should be a moment when to consider the "how" together with the "what".

The museum, thanks to the possibility of showing original objects, can create a sense of wonder and awe. The encounter of original objects, especially if brought back to the classroom by the teacher, can help pupils to memorise notions, to elaborate experiences and to organise their knowledge in a personal structure (Hein 1998). Furthermore, during the visit the pupils can experience a learning methodology quite different from the one they are presented with during classroom work. Such learning methodology is based mainly on practical, direct activities and on the encounter of the object itself. Moreover, pupils can learn from museum educators who often use modes of interaction quite different from the ones used at school, for they have no need to assess their level of knowledge and understanding. In this environment pupils feel more free to express their opinion, ideas, doubts and in so doing they can develop a personal approach to learning.

The effectiveness of the visit depends strongly on the relations that are established between the actors of the game: the teacher, the museum educator and the pupils. It is also important that they all share the same game-rules. It is this particular issue that we think would be interesting to analyse.

A visit to the museum: one

The teacher

"Yes, really a nice museum! Unfortunately the engine section was closed: if only I had known it before I would have prepared my pupils on another subject... It's always a question of luck: the guide they gave us was nice and helpful, but one never knows. The visit was divided in two distinct parts: the actual visit and the interactive workshop. In the first part we have been led through the exhibits on the history of technology. Some of them were unknown to the majority of the pupils. In the workshop the guide showed us some physics experiments which could be useful for my work in class. I didn't think that these experiments could be so interesting... but it will be still difficult to fit them in the curricular plan... also because, I must admit, some of the steps aren't completely clear to me and I would need a revision. Other experiences related to subjects that had been presented in class two months ago. No, No, my students behaved well, even though there were moments when they seemed to be uncontrollable... Anyhow they made a good impression!"

The museum educator

"Today I had a difficult class! No sooner had they arrived that the teacher asked me for a visit in sections that are now closed to the public. Even though she seemed to have understood that it wasn't my fault, she maintained an attitude of distrust all through the visit. Also in the lab she wanted me to do what she said! But I'm not a Jukebox!

I have a precise program of experiences to follow and couldn't always answer all her requests. At the beginning the pupils seemed to be interested, but soon they started showing the first signs of impatience: they wanted to sit, they didn't listen to me, they didn't look at what I was showing them. It was difficult to get them involved and they wanted to play.

In the lab it was terrible: they all wanted to participate, to intervene, to touch everything! And all at the same time! Then they said that they knew the laws of uniformly accelerated motion but when they saw the experiment with the falling balls they didn't know where to start! I would have liked to be less tedious but you know, when one speaks of physics and of kinematics one can't really be amusing can he?"

The student

"We went in the museum. The teacher paid for the tickets and gave us the last advice: listen carefully and take notes.

After having walked among strange objects for a few minutes we suddenly arrived in front of a great steam engine. It was so big that one had to step back to see it whole! Like an iron monster. It was a bit frightening but it was beautiful. It was just like the ones you see in films, but much bigger! How did they manage to build it? I really wouldn't know where to start! Maybe that was the very train my grandpa had taken when he went to war! I asked the guide but he didn't know. The man who guided us told us many things: about steam horses, speed, cylinders and pistons. It was a bit difficult to write everything on the note pad. I also took some pictures.

Then we went to the lab where the expert showed us some experiments that we had seen on the book on the conservation of energy and motion, and then some other ones on motion which weren't on the book but which were amusing. At the end, we tried doing an experiment with two balls rolling on a track but unfortunately it didn't work because there was "friction". On the other side one should have expected it for there is always friction!"

A visit to the museum: two

The experience described above is a hypothetical visit to a science museum, similar to the Museo Nazionale della Scienza e della Tecnologia 'Leonardo da Vinci' of Milan. It is seen through the eyes of the main actors involved: the teacher (the school), the guide (the museum) and the pupil. Although the story was constructed specifically to answer our needs, it still represents quite well a common situation in which the three protagonists don't always find complete satisfaction of their expectations.

What we want to do is to analyse, step by step, these three possible experiences so as to highlight useful elements to apply in reality. We will try to focus mainly on those "practical aspects" that can turn a museum visit either into a useful experience that will create memories and emotions or, on the contrary, into a tedious loss of time.

The teacher:

"Yes, really a nice museum! Unfortunately the engine section was closed: if only I had known it before I would have prepared my pupils on another subject... It's always a question of luck: the guide they gave us was nice and helpful, but one never knows."

Information

The relationship between school and museum is too often limited to the time of the visit, which is often experienced by pupils and teachers like an isolated activity, separate and distant from other school activities. The pupils and the teachers leave their "protected habitat", the school, and face what is experienced like a true jump in the dark: the Museum.

Now let's speak about *our* teacher. He knows something of the museum because he visited it the year before or from some general information found on the museum website. He asked for one hour of *general visit* and one hour of *workshop* in the Active Area dedicated to activities on "*Motion*". On the website he found useful information on the subjects to be discussed in the Active Area, but he knows almost nothing about how the presentation of topics in these Areas actually works. He has faith in the museum educator, but he fears that the level of his explanations might be too high (or too low) for his pupils and for himself for he does not have a specific preparation on those topics.

The fact that one of the museum galleries was closed to visitors is experienced as a discomfort, also because he *had prepared* his pupils precisely on that subject.

What we can deduce from the above is, before anything else, that the teacher asks to be informed and to participate actively to the preparation of the visit. This means knowing in advance the mode with which educational programmes are conducted, the people to which he will entrust his class and feeling less anxious about what may happen. Moreover, this gives the teacher the opportunity to plan his school activities effectively.

The teachers from Milan who participated to the SMEC project, before facing the visit, attended a series of meetings with the education staff at the Museo della Scienza e della Tecnologia "Leonardo da Vinci". Many said that they appreciated having a first contact with the museum, visiting the spaces, putting faces to names included in information leaflets, and being trained by the same people that would then work with their pupils. They added that all these things increased the quality of the actual visit.

"... The visit was divided in two distinct parts: the actual visit and the interactive workshop. In the first part we have been led through the collections on the history of technology. Some of them were unknown to the majority of the pupils..."

First the visit to the collections or the workshop in the Active Areas?

In a museum with both historical collections and active areas, visits usually follow the modality presented above. Some teachers have expressed their preference for inverting the sequence and having the workshop before the visit. They think that pupils, thanks to the workshop experience can appreciate more the historical objects and their function. So: is it better to start with the visit or with the workshop? One possibility is that of starting with a visit to the historical part, then stop at the Active Area and, after that, go back to the galleries. The first part would aim to provoke questions and raise curiosity about the specific observed objects. For example: "How does a train work? Why does the sand slow down a train and water does not?". That later turn, with the help of the museum educator, to general questions such as: "Does the sand always slow things down? And does water never slow them down? So why, when I move in water I feel "restrained"? Why can I fly in the water but not in the air?"

In the workshop you can observe different phenomena with the help of *exhibits* which most of the times are constructed with simple materials and can be reproduced in the classroom. By confronting it with what they saw, pupils should be able to understand the exhibit and, in turn, the phenomenon presented by the exhibit itself. Subsequently going back to the collections, the pupils have the possibility to observe the historical objects from another point of view, using the knowledge that they matured in the workshop. In this phase, as we will see, the museum educator has a very important task.

"... In the workshop the museum educator showed us some physics experiments which could be useful for my work in class. I didn't think that these experiments could be so interesting... but it will be still difficult to fit them in the curricular plan... also because, I must admit, some of the steps aren't completely clear to me and I would need a revision..."

Physics experiments...?

The Museum does not propose *experiments in physics*. The fact that the teacher attributed this name to them shows that he wasn't prepared for the visit. If this is what he expected it is obvious that he would feel disappointed with what he got during the visit. If in the galleries the museum shows objects, in the Active Areas it shows phenomena. And it does it with the methodology of informal learning, involving the pupils actively, stimulating observation and discussion without giving a "correct interpretation", using curiosity, amazement and surprise as tools. Surprise evokes curiosity of visitors - for example by using objects of the common life in an unusual way or by creating doubts and suggesting questions long forgotten because they were considered trivial or, worse, "unintelligent". For example: "is it easier to move or to stand still? Does balancing mean standing still?"

"... Other experiences related to subjects that had been presented in class two months ago. No, No, my students behaved well, even though there were moments when they seemed to be uncontrollable... anyhow they made a good impression!"

Out of control

We have already spoken of the first part: if the teacher had the chance to know in advance the museum and its staff, he could *plan* with them the modes and timing of the visit and, even more important, come to understand the educational-pedagogic methodologies.

Now let us briefly describe the role of the museum educator, even though it will be described in depth below. He is usually quite young, often a university student. He is rarely dressed in a formal way and he does not have any problem sitting on the floor with the pupils to speak *with* them (not only *to* them). Sometimes it looks as if he himself does not know the explanation of the experiments he created and so he asks for the pupils' help.

The fact that our imaginary teacher says that pupils seemed sometimes *uncontrollable*, reflects quite realistically what can happen during a visit. It is useful to remember that the mode with which pupils participate to activities in the museum is different from those commonly used in the classroom. The context is different. The authority of the teacher is balanced by that of the museum educator. The latter plays on its own territory, the former does not. Moreover the museum educator interacts with the pupils rather than with the teacher. So which is the teacher's role during the visit? Is it important for the pupils that he is present? Should he participate to the activity? And if yes, in which way should he do it? Should he stay on the

museum educator's side or on the pupils' side? This is an issue of great importance. It is fundamental for the teacher to find, with the help of the educator, a new role in the new context. He is in a position from which he can strongly benefit: he can observe his pupils in a new learning environment. The principal role of the teacher is to avoid the complete isolation of this experience. This is possible if the teacher knows what is going on during the visit, if he knows the *rules of the game*. The pupils seem uncontrollable to the teacher because they act in an unexpected way but this does not mean that the situation is not under control of the museum educator. A good guide knows how much space to give to his audience: he lets students participate *freely*, and knows where the limits of behaviour should be. His task is difficult for he must keep their interventions on the right path without constraining them along a fixed route, letting them build knowledge themselves. It is necessary to let the teacher know about these "rules", for misunderstandings can create tensions and problems.

The museum educator:

"Today I had a difficult class! No sooner had they arrived that the teacher asked me for a visit in sections that are now closed to the public. Even though she seemed to have understood that it wasn't my fault, she maintained an attitude of distrust all through the visit. Also in the lab she wanted me to do what she said! But I'm not a Jukebox!"

The juke-box

It is possible that a conflict arises in the relationship between teacher and museum operator. They are very similar: they both relate with the education of the pupils but some times have different ideas on how to achieve learning objectives. In *our* case who is *right*? The guide or the teacher? There is no doubt that the teacher is right to complain about the ill functioning of the museum information office for he couldn't get the services he was promised at the moment of his visit reservation. On the other hand, it happens quite often that museum educators find themselves under the pressure of requests, which can distort the aim and structure of the activities, but which cannot be refused, for the teacher always remains a *client*.

This problem can be avoided by planning the activities in the Active Areas (and educational programmes in general) with increasing precision. In this way the museum can make a more clear and detailed offer to schools. This can clarify the aims and objectives of the visit, where the museum does not intend to temporarily substitute the teacher in his work, but rather to complement it, by giving the opportunity to pupils to experience a completely new way of learning. If this is clear to everyone, included the pupils, it becomes obvious how it would be inadequate to try and reproduce the typical scholastic dynamics during the visit.

So we must say no to the teacher who:

- wants the guide to speak about a certain topic just because it is in the chapter that he will explain in class the next day;
- wants the pupils to take notes on what the educator says and not on what happens;
- intervenes to correct the "wrong" things the pupils say;
- wants the silence that is usually kept in class and limits the pupils' participation.

And no to the museum educator who:

- wants to teach (and examine...!);
- reveals the results of the experience before it is finished;
- does not involve actively the pupils, considering them only spectators;
- knows already the *correct* answers, or worse, the *correct* questions;
- does not adapt his language and attitude to the pupils he has before him;
- does not know how to go out of track, modifying the prepared course in relation to the comments and the observations of the pupils;
- does not listen to the pupil, but is only concentrated on listening to himself.

"... I have a precise program of experiences to follow and can't always answer all her requests. At the beginning the pupils seemed to be interested, but soon they started showing the first signs of impatience: they wanted to sit, they didn't listen to me, they didn't look at what I was showing them. It was difficult to get them involved and they wanted to play. ..."

They want to play!

What is wrong in this visit? It could be that *our* guide is not good, at least according to our view. He could be using the school educational paradigm. He wants pupils to be silent and *learn* from his words: otherwise

how can they *understand*? He is putting into practice a *teaching model*, which he indirectly learnt at school or in university.

The children want to play? This is a good starting point: it means that they expect to participate to something different from a normal lesson and the educator should be positively inspired by this attitude.

All this brings us to consider an important issue that is often neglected: the training of museum educators. In our opinion this should not only be based on the acquisition of specific scientific notions, but also on general knowledge, transversal to the topics that are presented. The guide should be so confident about the subject of the visit as to question it (and question himself) in helping the audience to find answers and to create new questions. At the same time, he must not be afraid to leave some of the questions unanswered and, in so doing, respect the right of the visitor not to learn everything. In general, the museum educator should stimulate questions rather than give answers.

Another aspect, which should not be neglected, is that where the teacher has months to build a relationship of confidence and respect with the pupils, the museum educator has to do all this in a short time. His work tools are his scientific knowledge, his positive attitude towards games, his will to make others discover in order to understand, and the capacity to listen and create emotions.

"... In the lab it was terrible: they all wanted to participate, to intervene, to touch everything! And all at the same time! Then they said that they knew the laws of uniformly accelerated motion but when they saw the experiment with the falling balls they didn't know where to start! I would have liked to be less tedious but you know, when one speaks of physics and of kinematics one can't really be amusing can he?"

Preparation of the visit

From the last two lines of the above paragraph it is possible to understand that this one is not a good science communicator. He *should* make science fun for children! We can also make some consideration on the terms he uses: *physics*, *kinematics*. He and the museum which employed him, wrongly believe that his role is that of teaching the laws of physics and to assess children's level of knowledge.

Here is an issue to which we referred only briefly before: the *preparation* of pupils and teachers to the visit: what should this preparation consist of? And is it necessary?

We believe that the teacher should get to know the museum, its aims and educational methods in advance. This would help him to build confidence and to fully utilise all the museum educational offers.

At the same time we don't think it is necessary for pupils to be prepared on the *contents* of the visit for they do not have to follow a lesson, prepare physics experiments or be assessed on scientific notions. Useful could be, though, a preparation relative to *collective participation*. Often children participate to the activities in an untidy and chaotic way, they might have difficulties in listening to the educator, they interrupt him frequently and moreover they interrupt their classmates. They do not have behaviour rules to restrain their enthusiasm and this can sometimes create problems during the visit.

We believe that this *education in learning* is a type of education on which both museums and schools should work and collaborate. In brief, preparing pupils for the visit means building their skills for group work: thinking, observing, building dialogue, respecting classmates with their ideas, adapting to the timing of different activities.

The student:

"We went in the museum. The teacher paid for the tickets and gave us the last advice: listen carefully and take notes..."

Taking notes

Again notes...! Some of the pupils are so busy taking notes that they don't have the time to participate to the activity. Of course it is quite useful to learn to take notes, but do students need to do it at the museum as well? The skills that should be developed during the visit are curiosity, imagination, observation, discussion and capacity to elaborate concepts; why lose time with notes when there is so much to do?

"... After having walked among strange objects for a few minutes we suddenly arrived in front of a great steam engine. It was so big that one had to step back to see it whole! Like an iron monster. It was a bit frightening but it was beautiful. It was just like the ones you see in films, but much bigger! How did they manage to build it? I really wouldn't know where to start! Maybe that was the very train my grandpa had taken when he went to war! I asked the guide but he didn't know..."

Wonder

To analyse this text means not only concentrating on the pupils' needs but also understanding their reactions to the teacher's and guide's actions.

Before anything else, we realise that the pupils' 'relationship' with the object is very direct, almost "physical". The object immediately activates imagination: and it is in this frame that the museum educator would consider it and use it with pupils. In the museum, thanks to the presence of reconstructed or historical environments, great machines, unique and fascinating objects, the educator can use types of communication that are different from those used at school. During the visit to historical collections he should not only explain but also tell stories, for example about: "travellers who in a foggy autumn afternoon, carried heavy trunks through the smoke of the train engine, with the station master shouting: "All on board!" The ladies with their long skirts would then hurry to get on the carriages, helped by men with tall black top hats."

After this the guide will surely show pupils the boiler, the cylinders, the rods of a steam train but why not make the most of the magical atmosphere of certain museum galleries? In our situation the guide obviously does not know if the train is precisely the one that the children's grandfather used during the war, but he could have answered that it was possible - or that: "It certainly was a train similar to this one but this specific model fell into disuse before the war". In short, the museum operator should not only present valid scientific contents but also bring the visitors to *live* an exciting adventure through time and space, in which dreams and knowledge mingle, and rational notions find a strong point of reference in the child's imagination. There is no doubt that the best way to transmit knowledge to both adults and children is through an attitude of excitement and playfulness. This is the spirit that should characterise the visits and, above all, the activities in the Active Areas.

"... The man who took us around the museum told us many things: about steam horses, speed, cylinders and pistons. It was a bit difficult to write everything on the note pad. I also took some pictures.

Then we went to the lab where the expert showed us some experiments that we had seen on the book on the conservation of energy and motion and then some other ones on motion which weren't on the book but which were amusing! ..."

Amusing experiments..?

The pupil remembers words such as *horsepower*, *speed*.. Does this mean that he understood their meaning? Or their importance? Moreover: are these the concepts that we want to transmit? The guide (but also the teacher) should ask himself *if* and *why* it is good to discuss about a certain topic at the museum, even before asking himself *how* he should present it.

We can notice another fact: the pupil said that he saw experiments which showed "physical laws": the exhibit does not *show* anything but itself.

So: what is an exhibit? In what does it differ from an *experiment*? The exhibit is a device that shows a phenomenon while the experiment is intended to demonstrate a law which describes the phenomenon. The aim of the exhibit is to let thoughts emerge and stimulate comparisons on the functioning of a machine, a phenomenon or a scientific idea. It is important for an exhibit to:

- present something that can be perceived or - even better - provoked by the visitors themselves;
- present something that is strange and that arouses curiosity and questions. Normally the first question is: why does this happen?
- allow the circulation of ideas in the field related to the object of the exhibit.

In our hypothetical case, the pupil probably repeats what the teacher or the guide said during the laboratory. The distinction we make between terms (for example: experiences, phenomena, instead of *physics experiments*) is not only a semantic exercise: it is of great importance, for in our case they refer to different concepts. When the teacher informs: "next week we will go to the museum *laboratory* to try some *experiments*", every child will turn to his own knowledge of experiment and will *prepare* himself for that type of experience. In this frame of mind it becomes obvious to take notes, check data, measure, calculate, to identify the physical laws behind the phenomenon! The same happens to the museum educators when they say: "Today I have a two hour *lesson*" or "...they *understood* all that I have *explained* to them..." etc.

Going back to the analysis of the pupils' text, there is a positive hint in the fact that some of the activities which were not on the book, were actually *amusing*. As we said, astonishment, curiosity, wonder, smiles are the key to an emotional world which contributes to increase interest, pleasure for knowledge and memory. An *unexpected* event is attractive just as a magician's illusion. Where is the person who, after having seen a magical illusion, has not asked himself: "Where is the trick? How can he do it? How does it work?" This question process is the spark to trigger off the interest towards science.

"... At the end we tried making an experiment with two balls rolling on a track but unfortunately it didn't work because there was "friction". On the other side one should have expected it for there is always friction!"

The experiment did not work!

Let us talk again about experiments: before anything else we must consider the meaning of the statement "the experiment did not work". Does it indicate that the experiment produced something different from what was expected or that there was something "wrong" with the observed phenomenon which did not result consistent with the theory that was supposed to describe it?

The experience produced effects that neither the teacher nor the guide were expecting. Real spheres (on real tracks), for example, do not always behave like the ones in the abstract problems discussed at school: there are many variables that can influence a physical phenomenon and often the person experimenting cannot identify them all. We would like children to be able to familiarise precisely with this variability, this search for the "hidden details", this observation of what really happens and not of what *should happen*.

Again, it is not only a semantic problem: there are no experiments that *do not work*, there are, fortunately, *unexpected phenomena*.

The "failure" of the experiment which the pupil refers to is attributed to friction. It is very likely that the sentence "friction is always present" was pronounced by the teacher during the activity. It is also possible that what he really intended to say was that "in our analysis we must consider that terrestrial phenomena are always influenced by friction, which on Earth is difficult to eliminate although sometimes it can be neglected". Of course the first expression is shorter but it also does not have the same meaning of the second one! Some of the readers might say: yes it is true, but it is comprehensible anyway...This is true only for those who share the same language conventions, experiences and knowledge. The science communicator must always be clear, rigorous and, as every good observer-experimenter (so as every child), must not give anything for granted.

Conclusions

Freedom, this is one of the key words of a museum visit: primarily the freedom for the pupils to learn. This is perhaps the point that is more difficult for the teachers to accept: at school pupils are "obliged" to learn, whereas at the museum this does not happen: They are free not only to decide if they want to learn or not (*open learning*), but also *how* to learn and what method and learning style is best for them: more experiential in laboratories and more historical and intellectual in the gallery visits. They can choose to interact with the guide and their peers and to influence, always under the educator's guidance, the sequence of the visit. This freedom can be vital for the visit; thanks to it pupils can get to know themselves better and therefore learn to structure their knowledge in a personal and effective way.

The other type of freedom is that of the museum educator who can develop an educational strategy adaptable to the pupils' needs, presenting them with a new point of view on "science". He can help them understand how they can "translate" what they learn at school with what is closer to their own personal experience and how to cultivate that attitude of curiosity and wonder that is often arisen by scientific knowledge. This freedom should be used to show a learning methodology more than to teach them what is correct or incorrect in their knowledge: it should bring them into a world of questions, research and observations that will help them learn to analyse themselves and the universe around them.

The different *freedoms* that interact during the museum visit must be respectful towards the learner's personality for he is the real guide of himself and in the building of his knowledge. The museum educator is there to *facilitate* and to show points of contact between the objects of the collection and the activities in the laboratory. This contact should necessarily pass through individual experiences so as to produce a true personal knowledge (Xanthoudaki 2000).

Quoting Michael Baxandall the museum visitor is defined as "an active observer in the space between the labels and the object" (Baxandall 1991, 40). We could say that the educator's duty is to make *the visitor an active creator of a space* between his own experience-personality and the object-experiment.

An ideal visit does not exist. There are many types of visit, many actors who participate (teachers, pupils, museum educators), and many different meanings that can emerge from the objects and the experiments-experiences. Going to a museum means building meanings and constructing points of view which start from one's own experience (Hein 1998); the visit can be a very creative moment in this sense.

It is difficult to imagine what the museum of the future will be like or which are going to be its visitors, but it is inevitable to ask ourselves certain questions: will we see many children and teenagers around museums? Will young people rediscover their interest in science? Will they be the ones to take their parents

to the temples of knowledge? Will the museum be able to actively contribute to the intellectual and emotional development of the individual? Will it be an element of cultural interchange and of social understanding? Will it propose a critical knowledge?

The SMEC project does not have the ambition to answer these inevitable questions, but it still tries to reflect upon the present situation relative to the relationship between the museum and its specific audience, the school. It also looks into the different methodologies utilised in various countries and it tries to develop a way of a sharing experiences and knowledge that has already been tested by numerous museums.

Only time will tell us if the results will be satisfying. Whatever might happen, the use of questions is the first step to the construction of a critical knowledge, truly open to the public. The importance of this project is mainly that of establishing relationships between the School and the Museum, of great importance for pupils' education. The starting point for the creation and selection of certain activities and methodologies has been the analysis of the differences between the two institutions and their respective competencies. The activities have been planned so as to be presented and reproduced in other European schools and museums. From the first stage of the work it has become clear that teachers' training does not only relate to the scientific contents, but also to everyday life behaviour. This gives the idea of a knowledge more complex than the traditional scholastic one with "watertight compartments divided by subject", and that relates also to metacognitive knowledge.

Just as a skilful speaker models its message on the base of his public, the modern museum's challenge is to find a way to communicate with different types of visitors, with particular attention to the school audience. In the future the ability of a museum to communicate effectively will be more and more significant for the definition of its own role.

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