

INTRODUCTION

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A. The European project

A Place to Discover is the first product of the three-year European project ‘School-Museum cooperation for improving the teaching and learning of sciences’ (SMEC) which began at the end of 2001 with the support of the Socrates/Comenius programme of the European Union. The project brought together museums and education institutions from six countries, namely:

1. Museo Nazionale della Scienza e della Tecnologia ‘Leonardo da Vinci’ (Coordinating institution), IT
2. Deutsches Museum, DE
3. Institut Universitaire de Formation des Maîtres de Lorraine, FR
4. Istituto Regionale di Ricerca Educativa (IRRE) Lombardia, IT
5. Katholieke Hogeschool Kempen, BE
6. Magyar Természettudományi Múzeum, HU
7. Museo Nacional de Ciencias Naturales, ES
8. Nationaal Museum van de Speelkaart, BE

As the title of the project indicates, its main aim is to contribute to the improvement of science education in primary school through the use of museums as important teaching and learning resources. In particular, the project aims to:

- encourage collaboration between educational institutions and museums involved in teachers’ training in science education for improving training practice and raising the quality of school teaching and learning;
- develop pedagogical methodologies and resources for producing, acquiring and applying knowledge in science, to be used individually or jointly by schools, training institutions and museums;
- offer support to the teacher in terms of her professional development and delivery of the subject in a competent and confident way that can also encourage the creative development of the pupils;
- improve museum provisions in order to make museums more effective training and teaching resources;
- develop a European dimension through sustained, long-term collaboration between trainers, teachers and museum educators across countries;
- help to raise teachers’ (and pupils’) awareness of the shared European scientific heritage.

The target groups of the project are primary school teachers, advisory teachers, teacher trainers and museum educators, not only members of the partner institutions, but more widely professionals in schools, education institutions and museums in each partner and other European countries. The basic tools for developing debate and dissemination of information are colloquia, educational materials, training courses, use of more than one languages (Dutch, English, French, German, Hungarian, Italian, Spanish), and use of the internet as both communication and distance learning tool.

Through the production of education materials (planned for 2002 and 2003) and the development of European In-Service Training Courses for teachers and museum educators (2004 onwards)³ the project aims to play a role in the museum-school educational relationship that sees both institutions as collaborative agencies which, without surrendering any of their distinctive character, are able to create a common ground for both teachers' professional development and for improving teaching and learning in primary school.

The present volume introduces to the project's philosophy and educational methodology. The chapters of the book contribute reflections on the use of museums for science (and interdisciplinary) education which can be used effectively and creatively in different contexts of museums, of schools and of countries (both within and outside the project partnership). Although some reference is made to the school curricula of Belgium, France, Germany, Hungary, Italy, and Spain, this does not create a limiting framework for the ideas and activities proposed. The topics and approaches contained in the following chapters are of a wide variety, ranging from more theoretical discussions to suggestions for practical activities to be carried out at school/museum. The team that worked on the book has consciously sought such variety in order to reflect the diversity of the project partners, to allow for each partner to contribute in its fields of strength, and to offer different readers and target groups a range of aspects from which to benefit.

B. Education in museums

A dramatic surge in the educational role of museums has occurred worldwide in the last couple of decades. We are witnessing the generation of a wide range of services for the public, varying from lectures, guided tours, school programmes, continuing and in-service education courses and publications, to hands-on activities, outreach initiatives, loan services and travelling exhibitions, all of which go beyond mere entertainment, towards free-choice learning and shaping of cultural identities. More than ever before education is perceived to be as important as research and conservation and becomes one of the priorities of the museum's mission (ICOM 2002, 8; Calamandrei 2002).

Among the main reasons for such development is the acknowledgement of museum education as a discipline with roots in the fields of pedagogy, psychology, sociology, museology and communication. Long research and careful study of both museum communication methodology and visitor learning and behaviour have contributed to the development of an educational approach that goes beyond a didactic and linear transmission of knowledge towards interactive, visitor-oriented teaching and learning.

³ Copies of the project publications and materials (the present volume as well as any future materials) are free of charge and distributed by project partner institutions. Some of the material will be also available in the project website www.museoscienza.org/smec. Information about training courses, which should begin in 2004 in Italy and be repeated in other partner countries, will be also published in the project website.

From such new perspective, the original object is no longer seen as the ‘possession’ of the expert who exclusively decides the content and means of communication but, rather, constitutes the basis for a meaning-making educational process built on the inter-relation between the object-document and the personal knowledge and experience of the visitor (Pearce 1990; Falk and Dierking 2000).

Visitor-centred learning has also brought attention to the existence of different audiences (schools, young people, adults, families, people with special needs, etc.), that come to the museum with diverse agendas, interests and needs. Provision of diversified services for each of those audiences contributes to improving access to the museum as well as learning methodology and outcomes.

C. Museums in education

School groups are among the audiences most present in the majority of museums as well as, in many cases, the priority of museum education services. Children are seen not only as the future museum visitors, but also as citizens and community members, of an age characterised by strong need as well as ability for learning. Museum visiting is considered an important educational tool for the development of pupils’ awareness of cultural heritage, of skills and knowledge (cognitive and historical), and of aesthetic and scientific understanding (Mattozzi 2000). On the other hand, building familiarity with such an experience helps the development of a regular relationship between the pupils and the museum, which is hopefully going to continue throughout their lives.

A step forward has been taken not only in the content of educational programmes for schools (no longer limited to the traditional guided visit), but also in the objectives and methodology of learning through objects:

“Whereas museum visits had previously been commonly regarded as an end-of-term treat, and a chance for the teacher to relax, the museum is now considered an important learning resource, a teaching support, and a means for developing a lasting relationship between the school and its surrounding territory. Following this period, recent work in the field of museum education for schools has been marked by an increasing realisation of the possibilities for cross-curricular, cross-disciplinary and inter-disciplinary learning” (Sekules and Xanthoudaki, 2003).

Situations of mere ‘tours’ around the museum or ‘unfocused’ participation in activities and workshops are increasingly given up in favour of collaborative work between schools and museums and of projects that extend the boundaries of work in school, broaden subjects of study, and recognise a wide range of both expected and surprising outcomes.

Collaboration means, or should mean, work on the basis of an *educational project*, that is, a framework within which the learning process integrates the work carried out in classroom and the needs of the ‘receivers’ (teachers and pupils) with the museum experience and the new knowledge to acquire. The learning aspect of an educational project implies a fundamental role for factors related to meaning-making and understanding of pupils, such as the already-acquired knowledge, personal experience, interests, motivations, social interaction with the other members of the group; while the teaching aspect integrates intentions, objectives and teaching methods, decisive for the orientation of the project. These two aspects relate to the work of both the teacher, who

devises the project on the basis of the work at school and of the needs of his/her pupils; and the museum educator, who works in collaboration with the teacher and contributes to the project as museum expert.

In other words, we are talking about a process built on the interactive relationship between the visit at the museum and related work in the classroom before and after the visit, an interaction that allows to exploit the unique pedagogical potential of original objects and the use of the museum as teaching and learning resource. Research indeed reveals that the education potential of the museum increases when opportunities are offered for linking the pupils' museum experience with their work in the classroom; whereas such potential is lower in cases of museum visits that are not made part of a project, or of museum activities that create no links with the knowledge and experience of pupils (Xanthoudaki 1998; Sekules and Xanthoudaki 2000).

Work on the basis of *educational projects* is perceived in most cases as a *three-part unit* of preparatory work, museum visit, and follow-up work in the classroom:

“The preliminary work may be carried out in school or out of school, and is used to prepare the students so that the maximum value can be gained from the visit itself.⁴ The museum or gallery visit acts to motivate, stimulate, provide a physical experience, and consolidate learning (...). It is essential that the experiences of the visit are recalled, discussed, evaluated, and responded back in the classroom, otherwise much of value will be lost. Very often although the visit is only one component in a programme of study, it is the hinge that articulates other aspects of the learning process, and as such is essential to the course of study” (Hooper-Greenhill 1991, 120).

The collaborative aspect of the project work also emphasises the value of discussion and that of creation of a climate of understanding respectful of the differing roles of each participant involved in teaching and learning. Terms such as *links*, *relationship*, *collaboration* require the development of partnership between the museum and the school, that is, a situation of ‘negotiation’ in which the two institutions compare their respective cultures, systems and knowledge-elaboration processes, commit themselves in terms of work and resources, and identify learning methodologies, strategies and tools (Mascheroni 2000; 2002).

D. Museum-school relationship in the context of the European project

On the basis of the above principles, the way in which an educational project is devised, and within it the relationship between visit and classroom work, should ideally remain open-ended, allowing for the search of the optimal solution on the basis of the intentions, resources and possibilities of the teacher (and learner) and of the museum.

In many cases, however, a range of elements within the educational provision of museums are decided *a priori* by their education departments, offering limited ground for change. Such situation appears to be the response to the particular circumstances set by museum collections, settings, and policies, that impose more, or less, flexible solutions. And, one should not forget, teachers are often bound by the requirements of

⁴ Preparation of the visit does not mean, however, a detailed and exhaustive preparation that takes away any element of ‘surprise’ from the visit, but rather the sensibilisation of the pupils to the unique character of the visit, and to the skills and knowledge to be used (*author's note*).

their curricula, focusing on technical definitions of subject areas, prescriptions or detailed outlines of teaching methodologies, and expectations for constant evaluation of learning goals. In other words, reality indicates that non-ideal situations often set the rule rather than being the exception. To this are added cases of museums with no educational provision (see Bolmont and Colson, in this volume) and/or cases of teachers lacking (or thinking they lack) specialised knowledge in teaching a particular topic or subject, or in using museums even for a class excursion (Bream-Hardy 2000; Sekules *et al.* 1999; Tickle and Xanthoudaki 1998).

Yet, even in those instances of ‘pre-set’ educational programmes for schools, of teaching-oriented restraints, or of provision problems, collaboration between schools and museums should not be seen as unachievable. In such circumstances, potential for improvement can well be found in one or more of the following: in *training* as tool for teachers in devising projects, even for those museums with no provision of education activities; in *museum educators going to schools*, helping this way to solve problems of distance or financial ones; in the *use of resources* for teachers’ professional development and for enriching pupils’ experience and work; in the *use of information and communication technology* for using museums through virtual visits; in *exchange* of experience and expertise between museums and between schools, etc. – in other words, in flexible alternatives that strengthen the museum-school relationship, reinforce the presence of both institutions in their territories, and do not tie the hands of teachers or museum educators in front of obstacles of practical, formal or content nature.

All this might be easier to say than to do. For this reason the SMEC project is set to study the feasibility of some of the above hypotheses on the basis of both expertise of the partner institutions and of new research in the field, and to propose educational materials and training methodologies for the improvement of museum-school collaboration. The proposals that would spring of the joint work of the project team operate at two different levels: at the level of teacher training and at the level of school teaching and learning through the use of museums.

With regards to teacher training, the project aims to develop a number of reflections as well as concrete materials and tools for offering teachers and museum educators the knowledge and competences related to content, strategies and ideas for devising collaborative educational projects as well as for evaluating them. On the other hand, at the level of school teaching, the project explores teaching and learning processes related to the use of museums by the teachers for science education purposes, and proposes activities and methodologies for expanding such work.

The starting point of the work in the three years of the project is the experience and current work of the partner institutions, which offers stimuli for the development of new ideas. The collaboration between different professionals – scientists, museum educators, researchers, teacher trainers, teachers, philosophers, historians, information and communication professionals – allows for the exchange of different points of view regarding the questions under study. The fact that the project team consists of persons from six different countries is seen as a positive aspect, because it allows to examine issues from the perspectives of different realities and therefore be able to formulate suggestions that *can* be used in different realities effectively.

This volume is a testimony of the partner institutions’ experience in the field of museum-school educational work. Its main objectives are to discuss issues relating to the topic of the project; to develop the common theoretical and methodological ground on which the team will build its activities; and to offer inspiration to professionals for

the development of debate and action. The authors touch on a range of issues, some of which I would like to discuss briefly.

In chapter one Filip Cremers discusses the issue of communication between the museum and its visitors. His approach is that of a museologist rather than that of a museum educator, analysing questions related to exhibiting and visiting as seen from the museum's point of view. His more general, theoretical contribution sets the ground on which the educational role of the museums will be then discussed. Being a complex institution in terms of content, function, mission, as well as physical setting, the museum might often cast a negative impression on people, due to its imposing nature and specialised content, appealing more to specialists than to the wider public. Decisions about display and knowledge elaboration and transmission are factors that determine the museum approach towards its visitors and, consequently, its success in encouraging access. On the other hand, the original object – the very reason for the existence of museums – is seen and 'treated' in many and different ways (as a 'sacred' item, as a document that contains/releases knowledge, as a tool for transmission of messages) always bound, though, to a role of education of the public. Cremers discusses such roles encouraging reflection about the educational mission of museums and about learning methodologies aiming to break the boundaries with the non-specialist public. His discussion considers several new, some times very innovative methodologies of display and explaining, such as virtual settings and use of new technologies, that very often impose a spectacular style, emphasising more the breath-taking effects than the fascinating-by-itself nature of the original object. Cremers presents an important reflection on the complexity of museum collecting, exhibiting and educating that 'hides' behind any museum situation. He offers a useful introduction to museum-related issues, aiming to develop understanding of more general, pre-museum-education-specific questions. Finally, his reference to the young public opens up the issue for the following chapters, which concentrate explicitly on the use of museums by schools.

In chapter two, Traudel Weber develops the theoretical discussion focusing on museum learning. Her arguments are based on research and study in museum education as well as on specific experience with schools at the Deutsches Museum of Munich. Attention to the learning process and identity of the learner replaced authority and objectivity as the basis of educational activities and resources in museums. Appreciation of the 'real thing' and personal experience become the starting points for cognitive, social and affective development in a process of learning through discovery and personal meaning-making. On the basis of those principles, Weber offers a number of examples from work at the Deutsches Museum as well as guidelines for the organisation of visits, the use of the museum as resource, and the possibilities for linking the visit to the school curriculum. Within those, the following points emerge as fundamental: the acknowledgement of the two agendas with which pupils visit the museum: the personal agenda (that is, their own expectations from the museum) and the school/museum agenda (that is, the teacher and museum educator expectations). Weber argues that "the outcome of any visit will be affected by the interplay between these anticipations and the actual field trip". However, the agenda of the teacher him/herself often appears not to be clear, and many teachers appear not confident in teaching science, a fact which affects process and outcomes of the pupils' experience as well as those of the educational project. Weber's contribution offers not only interesting reflections on museum learning, but also important points to be considered in the development of training opportunities for teachers.

In chapter three Pilar López García-Gallo, Dolores Ramírez Mittelbrunn and Soraya Peña de Camus Saez present the educational experience of the National Museum of Natural Sciences in Madrid. The description of a number of activities and materials offer a range of stimuli for creative use in different settings, but also make reflect on the characteristics of an effective methodology built on active participation and long-term skill development. The authors also make reference to the teachers' training course, offering important suggestions for the adequate preparation of teachers, seen with a very positive eye given the documented limitations in teachers' experience and expertise. Two aspects of the training methodology proposed by the authors deserve special emphasis: on the one hand, the balance between content training, focusing on the familiarisation with the museum collections, and theoretical training, focusing on the educational principles underlying museum learning; and on the other, the attention on teaching project-devising. The latter in particular helps teachers understand the different parameters involved in working collaboratively with the museum and offers them opportunities for experimenting with projects feasible in their own school setting. Such an approach to training offers the ground for important considerations in the field of teacher training – both in the context of the European project team and for teacher training in general. The three main elements for developing teachers' competences in using museums as educational resources are a balance between a) content/collection knowledge, b) methodological knowledge, and c) skills for project-devising (and evaluation). Knowledge in these three areas allows for teachers to develop not only the necessary familiarity with a particular museum, but also the skills needed for using any museum within or outside their territory.

In chapter four, Enrico Miotto discusses the issue of science education from the point of view of the museum educator, based on his long experience of work with schools at the Museum of Science and Technology 'Leonardo da Vinci' of Milan. His contribution offers very important reflections on the different, and often complicated, aspects of work in the field of museum education, of interest to both museum educators who develop programmes for schools, and to teachers who get to know a teaching and learning approach often different from their own one. According to Miotto, the museum as learning resource operates in ways different from those of the school; and this should be seen as an element for enrichment rather than conflict in the context of joint work between the two institutions. Educating processes in the museum are based on the visual and multi-sensory exploration of objects and phenomena, a process through which pupils are guided by a trained educator in the role of 'facilitator' rather than that of teacher. Starting points are objects and questions on which the pupil/visitor builds his/her own personalised itinerary of investigating and understanding. The informal character of the learning process, as well as the opportunities for encountering original objects and first-hand phenomena, have an intense impact on both cognitive and affective aspects of pupils. This is the reason why a museum visit placed at the early stages of the study of a topic functions usually much better than one placed at the concluding stage. The former aims to offer visual stimuli and arouse interest for further study and reflection, whereas the latter aims to consolidate knowledge. Collaboration between museum educators and teachers is therefore important for the integration of the two approaches, without sacrificing the teacher's programmes and objectives nor the museum's original educational approach.

In chapter five, Zita Felfoldi and Judith Holler present their work at the National Natural History Museum of Budapest. The detailed description of the museum, parallel to that of the other museums involved in the project, in the other chapters, serves a

double purpose: offering the reader a basic knowledge of the context in which educational work is developed, and helping the teacher who, in the context of the European project, chooses to work with the Hungarian Natural History Museum from a distance, with the help of the project website and educational materials. The presentation of the two programmes ('*Look, Listen, Feel*' and '*Watch your Step Swamp*') offers two interesting examples of work with pupils in the museum, and of work at school with the help of the museum educators. The authors make reference to the current educational requirements, in Hungary as well as elsewhere, for developing rich experiences for pupils through a range of resources and settings. In this context, activities like the ones presented can be used by museums and/or teachers for the development of stimuli and experiences by pupils.

Museum educational provision and its problems is one of the issues analysed by Etienne Bolmont and Francis Colson in chapter six. The diversity of museums and of educational activities across the French territory (a feature shared with any other country) imposes diversity both in quantity and quality of educational provision. Teachers should not seek only visits to large museums or be discouraged by issues of logistics or distance, the latter arising for a school visiting a large museum. Diversity should rather be seen positively as plurality of contents that can be used creatively by teachers who should be able to exploit and utilise *local* resources, especially through opportunities for developing synergies. In this context, the suggestions by the Spanish partners about the approach to teacher training come as a fundamental pre-requisite. More than getting to know the collection of one museum, teacher training should focus on *educational methodology*, equipping teachers with the competences for using a range of museums. Following the theoretical reflection, Bolmont and Colson suggest a number of activities for schools that can be carried out on the basis of work with museums in their locality. These activities are being experimented by the French partners during the first phase of research of the European project (2002) in collaboration with a number of schools around Nancy in order to be proposed, for experimentation with schools in the other partner countries, during the second phase (2003).

Research is a fundamental component of the European project, aiming to the development of materials that can be proposed to teachers throughout Europe. Activities with museums are devised and carried out by all partners in collaboration with schools. Another example of such activities is offered, in chapter seven, by Jef Van Den Bosch and Filip Cremers, who present the results of the collaboration between the Belgian Katholieke Hogeschool Kempen and the Museum of Playing Cards focusing on the use of museums for science education. Van Den Bosch and Cremers contribute further materials to the experimentation of the European project with schools, materials which could be used as the basis for educational project devising by any teacher interested in working in those topics. Based, on the one hand, on the interesting approach of the Dutch curriculum requirements, mainly for geography, technology and natural science education, which seek the active use of pupils' own knowledge and skills in research, observation, making and evaluation activities; and the stimulating collection and educational experience of the Museum van de Speelkaart (interesting the use of printing factory workers for education purposes), the authors propose contents and materials for multi-disciplinary, museum-based learning. One point deserves particular emphasis within the chapter, relative to the teachers' role during the visits: the teacher is not a mere escort of the pupils, but is encouraged to be present and take part in processes and to participate in the training courses organised by the two institutions.

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