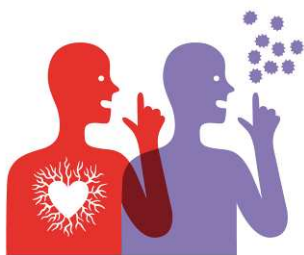




Education and Culture DG

Lifelong Learning Programme



PILOTS

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D2.1 Annex: Report on the state of the art

Workpackage 2: Quality Assurance methodology

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Table of Contents

| | |
|---|----------|
| 1 EXECUTIVE SUMMARY | 3 |
| 2 FACILITATION IN ADULTS LEARNING AND FACILITATORS AS ADULT LEARNERS | 4 |
| 2.1 European Commission point of view | 4 |
| 2.2 Who adult learners are | 7 |
| 2.3 Main philosophic approaches for adults' education | 8 |
| 2.4 Main philosophic approaches for adult education in museums | 12 |
| 2.5 Informal environments for learning science | 15 |
| 2.6 The human factor | 20 |

1 Executive Summary

This state of the art report explores the panorama of the adults learning field, in particular on science and technology learning. It focuses on adults, in the double meaning of the explainers (who are adults, and have to be trained to be good mediators) and adult visitors (who are one of the targets of the explainers' job). It gives a short summary for the different aspects of the considered topic, and the basic bibliography for every aspect.

2 Facilitation in adults learning and facilitators as adult learners

2.1 The European Commission's point of view

A democratic society cannot afford to leave anyone behind. It has to offer anyone a chance to keep up with fast-developing knowledge technologies whilst the landscape is thoroughly altered by competition between human beings and by an increasing demographic pressure. Whereas technologies improve our lives' comfort, they isolate people who are labelled as "victims of digital divide". On the other hand, immigration is often regarded as a problem, while skilled migrants can represent a rich resource for western society.

As well as this macroscopic standpoint, a personal one is now arising. Higher competitiveness and forced economic growth often cause social exclusion. When individuals feel marginalized, they are more likely to fall ill, provoking higher healthcare expenses. Furthermore, they retreat from social participation and become passive citizenship.

In this context, aging people feel like they have lost skills and gained obsolete competence. In order to rescue this large part of society, a wide range of educational programmes have been set up for adult learners in time.

From the 1997 Amsterdam Treaty, through the European Council in Lisbon in 2000, governments have repeatedly been calling on the promotion of the widest access to education for their peoples. This is just one of the several reasons why EU countries are struggling, though at different paces, to draw adult people attention to their own education. This group of initiatives are often known as adult education programmes. Lately a new label has been preferred: lifelong learning, because it refers to the

acquisition of basic proficiency with effectively using information all over the life span, focusing on the learner rather than on education itself.

More recently, then, lifelong learning no longer thoroughly fit the concept. Life-wide and life-deep learning have been added to the mission. The first refers to the learning taking place as people regularly and irregularly get across a wide range of social settings and activities. Thus, learning comes from this breadth of human experience, whether individual or not. The second one, instead, refers to beliefs, ideologies and values people associate with their living life and participating in the cultural working either of their respective communities or wider society. This peculiar kind of learning seems to reflect the ethical, religious and social values steering people's way of believing and judging themselves and others. No learning, then, is a free-culture endeavour.

Along with this enhanced pattern of scheduled initiatives, adult learners are more likely to enjoy their own personal growth and development, becoming active citizens enabled to deal with the required key competences aimed at accomplishing their life-mission.

EU actions plan to raise adults' competitiveness to let their skills meet the need of the labour market, while this huge and ongoing demographic change is having a major daily impact on our societies and economy. Education and training provision can lead aging European adult learners to ensure immigrants achieve a better integration in our society, helping our labour markets and economies to thrive.

Adult learning plays a key role in combatting social exclusion too. Poverty leads to social exclusion, and low levels of education lead to poverty. This vicious circle can be broken only by improving education and openly tackling new kinds of illiteracy like informatics and communication technologies.

If personal growth is regarded as a first step to a broader active citizenship, then lifelong learning is a goal to achieve. And it is no longer a point of discussion, because lifting up the barriers to adults participation, ensuring quality in teaching methods and staff are some key policy messages aimed to fulfil our societal needs. Namely, reducing labour shortages and early school leavers (about 7 million in 2006 all over Europe) by offering a second chance to those who actually have no qualification. In the meanwhile, the focus is on reducing social self-exclusion whilst increasing migrants' social participation.

Bell, P., Lewenstein, B., Shouse, A., and Feder, M.; *Learning science in informal environments: People, places, and pursuits*. National Academies Press 2009. Washington, D.C.

Gibbs, K., Sani, M., Thompson, J.; *Lifelong learning in Museums. A European handbook*. Edisai 2007. Ferrara (ITA)

Promoting Adult Learning, OECD (2005).

Schuller, T., Preston, J., Hammond, C., Brassett-Grundy A., Bynner J., *The Benefits of Learning*, University of London, 2004.

http://ec.europa.eu/education/lifelong-learning-programme/doc86_en.htm

http://ec.europa.eu/education/lifelong-learning-policy/doc58_en.htm

www.eaea.org

http://europa.eu/eurlex/en/treaties/dat/C_2002325EN.003301.html

http://ec.europa.eu/employment_social/news/2007/jun/flexicurity_en.pdf

http://ec.europa.eu/education/policies/2010/doc/comm481_en.pdf

2.2 Who adult learners are

Adults are not alike. They are all particular individuals who have different beliefs, perspectives and skills based upon much different life experiences. This is just one of the reasons why adult educators have to deal with adult learners in a completely opposite way than that helping young students grow up in traditional school's classrooms.

Of course, young and adult learners have common traits. For example, they both like to be treated with courtesy and respect, enjoy contributing their own knowledge, experience and opinions to the learning process, appreciate having an element of choice and, last but not least, do not like to be talked down to or feel patronized. On the contrary, as grown-up beings, adults really like to be autonomous in their choice.

Moreover, they need to be self-directed in every decision-making process. Although the entire literature related to adult education states adult learners choose independently whether to attend learning processes or not, there are some peculiar contexts (e.g. museums), where they can "fall trapped" by chance, maybe taking their children to these peculiar venues.

On the whole, adults are goal-oriented. They act for a purpose. At least in the beginning, they start out by being extremely practical, namely seeking for the tools to achieve their aims. When goals are not so plain to see, educators can harness learners' emotions to let them feel deeper involved in the learning process. Despite this general pattern, some adults would be likely to fold their arms and wait to be taught passively by educators, like in the old days of primary school.

Biases and misunderstandings always occur because adult learners have accumulated experience throughout their lives, and that represents a strong base made of previous knowledge. This is a multi-layered field of knowledge where to start from in order to let new information leave a "seed".

This is a process that can last different lengths of time and face different hurdles to get over. When learning is for a purpose, it is less about memorising facts and pre-digested information and more about new ideas, skills and experiences. This is likely the reason why many researchers say that, despite the fact adults' memory isn't weaker than youngsters', they need to find a meaning specifically related to their roles, aims in life and everyday practice, otherwise it all can lead to a memory deterioration. That is, loss of learning.

Edmunds, C., K. Lowe, M. Murray, and A. Seymour. 1999. *The Ultimate Educator. National Victim Assistance Academy (Advanced)*. Washington, DC: U.S. Department of Justice, Office for Victims of Crime.

Klatt, B. 1999. *The Ultimate Training Workshop Handbook: A Comprehensive Guide to Leading Successful Workshops & Training Programs*. New York: McGraw-Hill.

Knowles, M. 1973. *The Adult Learner: A Neglected Species*. Houston, TX: Gulf Publishing Company.

Lorge, I. 1947. *Effective Methods in Adult Education: Report of the Southern Regional Workshop for Agricultural Extension Specialists*. Raleigh, NC: North Carolina State College.

Mager, R. F. 1992. *What Every Manager Should Know about Training*. Belmont, CA: Lake Publishing Company.

McLagen, P. A. 1978. *Helping Others Learn: Designing Programs for Adults*. MA: Addison-Wesley Publishing Company.

National District Attorneys Advocacy Center. 1999. *Train the Trainers Workshop*. Columbia, SC.

Pike, R. W. 1989. *Creative Training Techniques Handbook*. Minneapolis, MN: Lakewood Books.

Tough, A. 1972. *Adult Learning Projects*. Ontario: Institute for Studies in Education.

Zemke, R. and S. Zemke. June 1995. "Adult Learning What Do We Know for Sure?" *Training*.

2.3 Main philosophic approaches for adults' education

Adult education strategies underpin a wide range of different teaching methodologies deeply inspired by different philosophical approaches.

Over the past forty years there has been an outpouring of scientific research on mind and brain. Some have called it a “cognitive revolution”. Apart from names and labels, new theories about knowing and learning are based on the increasing data amount cognitive research collects and stores everyday. Among this vast variety, just a few theoretical perspectives have been particularly influential, affecting the learning fields right from the roots till the education branches.

We must admit there is formal confusion about tenets and strands. Many scholars, in fact, gauge behaviourist, cognitive and socio-cultural theories as pivotal benchmarks in the field, while others like to stress the importance of liberal and progressive approaches. Some others, then, underline humanist and radical cultural ways of learning. Let us take a look at all these perspectives.

- **Liberal philosophy** aims to seek knowledge for its own sake in order to gain a “well rounded” perspective of the entire world. The mission is accomplished through a lifelong process of stimulation and development of mind underpinning principles and absolutes. The teacher is only an expert transmitting knowledge by challenging students to absorb information and think about it critically.
- The **progressive adult education**, instead, is aimed to promote a practical knowledge, in order to provide individuals enough problem-solving skills relating to their lives. Also in this approach the learner’s education comes up from his life but, unlike in the liberal one, the individual takes an active role in the learning process because his interests, needs and expectations shape the process itself. The teacher is a guide who helps students lead the game of life and learning.
- According to the **behavioural adult education approach**, learners are not involved in setting goals, but only work hard to develop some skills leading them to the next step of their education. Behaviourism describes knowledge as the organized accumulation of stimulus-response

associations learners need to build up their skills. Step by step, individuals change their behaviour within a structured education environment whose driving force is represented by the asset “people have been programmed since the day they were born”. Thus, they need to be reprogrammed to cause behavioural shifts. Simple skills are acquired and then combined to produce different behaviours. The formation of new skills, then, hinges on rewards and punishments.

- The **humanistic education** tends to enhance personal growth and development. Besides, it allows learners to be involved in knowledge construction and “meaning making” and cultivate the self. Thanks to this, learners are motivated, focused on the objective and find easy to direct the process. Even though, teachers are present to balance the different learning styles and goals of students, by supporting anyone’s potential.
- **Cognitive theories** focus on how people develop, transform and apply structures of knowledge in relation to lived experience. Learners actively construct their understanding by connecting new information with their previous knowledge. The self is the main actor of this perspective.
- **Socio-cultural theory** builds on cognitive tenets but emphasizes the social side of human development. As they become competent and proficient in practices particularly well-valued in specific communities, this implies social relationships. Individuals refine specific skills growing on the individual blend between past experiences and new information.
- **Radical adult education** builds on the previously mentioned perspectives but emphasizes the need to introduce change in society’s culture, politics, economics and so on. Students share the purpose to raise awareness of issues of social justice, empowering one another to fight for change. That’s why the individual is a voluntary part of the process, equal to teachers who only coordinate students’ strategies to challenge the status quo. Problem posing, social analysis and critical theory are the methods by which radicals increase their skills to get the set goals. Paulo Freire, Jurgen Habermas and

Ivan Illich are the best known representatives of this approach which was very influential during the sixties and the seventies.

These approaches shouldn't be regarded as monadic and isolated theories. On the contrary they need to be considered different standpoints that sometimes can be complementary tools, merging in the same task. That is why a brand new approach, called an *ecological framework*, has recently been brought forward. It builds on balance between different aspects of learning. Namely it focuses on people, places and cultures, using each as a lens to examine several learning environments enabling scholars to tease out the multiple features intertwined in any learning process.

One of its tenets states that the knowledge-focused domain cannot be isolated from the domain of social identity. Its development and elaboration are linked to the affective and motivational issues catalysing learning. That said, we can spot a shift in focus from the individual learner in isolation to culturally variable participation structures and from the process through which individuals move from simpler tasks to higher level and more central positions of responsibility and expertise as they learn new capabilities.

Gardner, H.; *Art, Mind and Brain*. New York: Basic Books. 1982

Bell, P., Lewenstein, B., Shouse, A., and Feder, M.; *Learning science in informal environments: People, places, and pursuits*. National Academies Press 2009. Washington, D.C.

Gibbs, K., Sani, M., Thompson, J.; *Lifelong learning in Museums. A European handbook*. Edisai 2007. Ferrara (ITA)

<http://www.funderstanding.com/category/content/theories>

<http://www.personalitypathways.com/>

<http://roberta.tripod.com/adulted/methods.htm>

http://fcis.oise.utoronto.ca/~daniel_sc/faqs/qaindex.html

<http://radiographics.rsna.org/cgi/content/full/24/5/1483>

<http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/adults-3.htm>

http://emarketing.delmarlearning.com/milady/milady_news_fall05_classroom.asp

<http://www.ojp.usdoj.gov/ovc/assist/instructor/section2.html>
<http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/adults-1.htm>

2.4 Main philosophic approaches for adult education in museums

George E. Hein represents a world famous milestone of learning in museums. His interpretational study of the field can be represented through his famous 1998 diagram about the perpendicular influences of learning and knowledge theories. His graphic summary is so popular in the museum dimension that a lot of other foreign scholars and museum personnel regained it to let newcomers easily learn the field state of the art. His diagram summarizes the edgy ends of theoretical perspectives on knowledge and learning and produces four standpoints. Among these four edges several shades of approaches thrive, though.

Liberals and behaviourists, Hein states, regard knowledge as existing outside the learner while humanists and (socio)cultural representatives think it is all constructed by the learners' personality and environmental context. Those who believe in an external and universal knowledge support a bit by bit-feeding and stimulus-response learning theories, whereas the opponents' beliefs build on the power of self-discovery and constructivism.

Hein's summary looks easily right at first sight. But it is rather rough. Learning museums landscape is a more complex painting than he drew. Therefore, he does not deserve the great influence he still wields throughout the world.

Nevertheless Kirsten Gibbs, Margherita Sani and Jane Thompson, who edited a handbook on lifelong learning within museums, consider some of the above mentioned statements pivotal to provide successful learning opportunities in museums. Though, museum environments are peculiar and have developed different learning approaches on their own, far differing from traditional arts

museums to science museums and centres. Broadly speaking, they individuated four further approaches, partly regained by Hein itself: instructive or didactic, active or discovery learning, constructivist, social constructionist.

- In the didactic or instructive approach museums regard themselves as teachers whereas visitors are considered as a large and passive audience. Its advantages hinge on the delivery of content that is likely to be quickly memorised. The disadvantage, on the contrary, is that knowledge is selected by some experts and allows few chances for visitors to discuss. Learning is steady and fixed but cumulative, knowledge is universal and neutral. Everyone is assumed to learn the same way. This approach resembles the liberal and behaviourist philosophies and it proliferates within ancient traditional arts and history museums.
- The active or discovery approach shows learning as a process of inquiry involving role-playing and activity-based, direct participation by learners who are seen as active characters rather than passive audience. In this frame a large use of hands-on and interactive exhibits is made. This framework has been very popular over the last thirty years, especially in science centres and museums.
- Constructivism builds on many different approaches included in the cognitive theory of learning processes. It is associated with Jean Piaget, Jerome Bruner, Benjamin Bloom and Howard Gardner, who brought forward several strands of learning theory, stressing different developmental stages through which people learn. Everyone of us, roughly according to all of them, own different qualities, named intelligences, stretching from verbal linguistic to naturalistic one, going over spatial, musical, kinaesthetic, logical and inter/intrapersonal skills. Personality and environments lead us to harness just some of these qualities to the detriment of others. That's why we

all approach different ways to learning and, thus, museums are approximately changed into forums in which a lot of different learning styles coexist. Constructivism focuses on learners/visitors rather than exhibits and things. Since learners bring their own perspectives in the process, educators attempt to provide them a range of different learning opportunities specifically tailored on the individuals. This approach has lately been successful everywhere.

- In the social constructionist approach visitors are seen as interpreters who have the right to negotiate knowledge according to their own identity and position in society. The context where knowledge is constantly shaped and renegotiated is regarded as more important than contents or exhibits. This approach, then, underpins the above mentioned socio-cultural or even radical philosophies.

Constructivism is still very successful in science museums today. According to Bronwyn Bevan and Maria Xanthoudaki, almost every contemporary theory underpinning the rhetoric of teaching and learning in the museum field is imbued with constructivism. In this framework, learning is a cognitive and affective process of exploration and experimentation intertwined with previous experience and existing knowledge. Contemporary museums, then, look for a negotiation between existing patterns of knowledge embodied by tools, spaces and exhibitions and the patterns already dwelling inside the individual. Approximately, learning depends on the meaning the visitors develop through their experiences in the museum. Miles away from any knowledge transmission theory, though, constructivism conceptualises the learner as a potentially isolated individual constructing knowledge through experience developing in the brain. As such, this conceptualisation leaves room for understanding the purpose of learning as the acquisition of bits of knowledge, the process of learning as moving ideas from outside to inside, and the learner herself as being culturally neutral and or socially isolated. But beyond constructivism, the authors say, a new approach regards

learners and knowledge bits as emerging in activity, not existing in isolation from one another. Therefore, learners-learning-knowledge-context emerge in activity being a unity pattern.

Bell, P., Lewenstein, B., Shouse, A., and Feder, M., *Learning science in informal environments: People, places, and pursuits*. National Academies Press 2009. Washington, D.C.

Bevan, B., Xanthoudaki, M., *Professional development for museum educators*. Journal of Museum Education, 2008, 33(2), pp. 107-119

Gibbs, K., Sani, M., Thompson, J., *Lifelong learning in Museums. A European handbook*. Edisai 2007. Ferrara (ITA)

Padro, C., *Mapping learning theories in museums*; Collect and share report; 2004; Barcelona

Hein, G., *Learning in the Museum*. Routledge, 1998. London, New York

Hein, G., *The Museum in Transition. A Philosophical Perspective*. Smithsonian Institution; 2000. Washington, London

2.5 Informal environments for learning science

The research field devoted to science museums and centres as learning environments produced and provides an endless bibliography, spanning a myriad of perspectives. Thus, instead of painting a messy portrait of this limitless field of flourishing bibliography, we will focus on the few main tenets elicited by the most popular approaches about informal education.

Fetching the above mentioned philosophical approaches and packing them all up, it is proper to underline that, apart from didactical/instructive and liberal one, all the other ideals of education grow out of mainly informal environments.

Informal or non formal environments, completely differing from traditional schooling, do not force participation, though this is suggested. Nor do they have the historical task to improve the learning of academic knowledge.

This approach has completely changed the museums' roles and standpoints into a more interactive and involving strategies of interfacing the public. This especially occurred within science museums and science centres who adopted different strategies all aimed to strive for the mixing ideal of engaging visitors to science, entertaining and informing them at the same time. This is the kernel of informal learning environments underpinning the above knowledge theories.

These venues and approaches strive hard to develop interest in science right from early stages of physical and mental development. Research suggests that personal interest and enthusiasm are important for supporting children's participation in learning science, even though early interest doesn't guarantee extended learning. Nevertheless, early engagement can even trigger and bolster motivation to explore the scientific field, broadening perspectives and experiences that can persist throughout the lifespan.

Besides developing interest in children, informal environments such as science museums and centres address older people to update them about the latest concepts and theories as well as well-grounded scientific milestones. From this superficial understanding, some informal environments help adults reason in a scientific way, namely looking at reality through the lens of constantly questioned and refined evidence that sometimes can even be turned upside down. Informal environments are better suited than traditional teaching venues to providing chances for people to experience some of this process' excitement. The right place where to achieve these goals is an informal environment which is generally defined as non-threatening. This means it provides a safe and open-ended environment for engaging with science. Learners can choose, discover free pathways without being

afraid of any reproaching and feel free to speak their voice because these structures ought to build on the different learners' culture, motivation and proficiency.

No matter whether learners and teachers find themselves in a narrow four bare-walled prison cell or unleashed in a vast green field of sunflowers, they feel physically and psychologically fit and comfortable within the learning environment. Comfort, after all, hinges on the absence of infinite lectures, periods of painful everlasting sitting and on the almost constant presence of practice opportunities. An active learning process can bring learners to achieve their goals sooner than a boring one. Apart from this, the role of teachers is pivotal, no matter where they are. Adults, in fact, feel like they have something to lose in such situations. Self-esteem and ego are at stake when they are asked to risk trying a new behaviour in front of peers and audiences. This can be due to past bad experiences in traditional education or to feelings about authority and concerning events of everyday life. This is why educators must acknowledge the individuals who stand before them, the best they can. The great deal of life experience brought along by adults, therefore, should be always used as an invaluable asset of richness to be tapped and exploited. Furthermore, adults can learn well and much from dialogue with peers. Explainers must have the tendency to facilitate rather than hold forth. They ought to encourage them towards active participation in the process. In this framework, a two-way flow of communication is on. In fact, learners are dependent on instructors for feedback on skill practice whilst instructors hinge on learners' curricula and performances. The keyword for explainers is control. A balanced control of the presentation of new material, debate and discussion, sharing of relevant student experiences, and time. It seems that educators are best able to establish control when they risk giving it up. When they shelve egos and stifle the tendency to be threatened by challenge to plans and methods, they gain the kind of facilitative control needed to effect adult learning. His/her goal is to protect minority opinion, keep disagreements civil and unheated, make connections between various opinions and ideas, and keep reminding the group of the variety of potential solutions to the problem. The instructor is an orchestra conductor rather than an advocate. Above mentioned

learning and teaching theories work better as resources than as some Rosetta stone to be literally translated and learnt by heart. An eclectic, rather than a single theory-based approach to developing strategies and procedures, is recommended for matching instruction to learning tasks.

To get the first informal learning stunning environment, we should go back to 1969 in San Francisco, when Frank Oppenheimer founded the Exploratorium science centre. Oppenheimer's belief was based on the conviction a science centre ought to be a far different environment from traditional art or science and technology museums exposing stuff and displaying objects. A true science centre, like the Exploratorium was bound to be, would have let people interact with objects as an experimental scientist does in the everyday natural world or inside a laboratory. This new kind of museums was to teach that science is all around us, hence its comprehension is available to all. The purpose was to remove science from the exclusive domain of experts, hiding and disguising concepts behind opaque, unfathomable and abstruse formulas and patterns, in order to demystify it and to restore the common sphere. It was all about convincing people that doing science might have been interesting and fun for everyone.

Frank Oppenheimer, with his co-workers and successors, showed that an enhancing science-based society was bound to face counterintuitive events which can often oppose normal experience. For example we can cite Isaac Newton's first law about constant velocity on a straight line or even Galileo's demonstration that, in the absence of effective friction, light and heavy stones fall at the same speed. Nevertheless, though Copernicus' ideas have been proved valid for so long, it's still so easy to slide back to more intuitive Aristotelian physics. This is why in the Exploratorium and in almost any science centre all over the world there is always a sector entirely devoted to phenomena of perception and illusion. A task greatly emphasized by the new scientific frontier represented by quantum mechanics. Truth sometimes lies behind appearances and science can become tricky to seize.

Apart from hard science, though, science centres differ from traditional museums offering a passive visual experience. Instead, these new environments try to tempt visitors to interact with objects, experiencing an active role inside museums. The visit turns out to be a *plore*, something to be explored as every scientist did in time and currently does.

Thus, exploration is not something previously defined and doesn't proceed along regular stages. On the contrary it underpins a context of continuous surprises, quests, tricks and stimuli. This is the basic reason why science centres provide the visitors a unique and pathless environment. Visitors are not compelled to walk down an imaginary line to enjoy the exhibits, but they must feel free to wander, wonder and walk about. It's freedom of research and exploring represented within a building. Visitors are allowed to test this free-choice environment, touch and interact with objects. Through this, they can find their own way of learning, deeply related to and connected with their own previous beliefs, knowledge and life experiences. No universal results, no shots of conventional outcomes should pop up at the end of the path inside people's minds.

Not only can this informal environment easily attract pupils who can merge fun with learning (or draw learning out of fun), but it can even satisfy adults expectations about freedom. Being free to choose and experience anything they will, they should slowly realise informal contexts can provide knowledge bits as well as traditional strict schooling paradigms. There are differences in methodologies, processes and ways these bits are provided, though. In fact, context and atmosphere are important for how things are seen.

Differences between formal and informal environments are summarised as follows:

Formal learning
(characteristic of school education)

Informal learning
(characteristic of several different situations and sites, such as museums, science centres, theme parks, multimedia, science education materials, ecc.)

Process conducted by the person who teaches
 Based on the class or type of school
 Programmed
 Direct and structured
 Mandatory
 Sequential
 First: concepts – second: examples – third: experiment
 Few non expected outcomes
 Social aspect not central
 The timing is not chosen by the user
 Assessed and certified

Process conducted by the learner
 Out-of-school activity
 Not programmed, and episodic
 Non direct and without legislation
 Free-choice/voluntary
 Casual, non structured, non sequential
 Practical experience might be predominant

 Many non expected outcomes
 Social aspect central (cooperative learning)
 Timing chosen by the user
 Not assessed, nor certified

Of course, nowadays, in science centres visitors can deal not only with objects but computers. There is a human side to informal learning called explainers, too. How should they behave not to “explain” coherently with formal learning or with likewise techniques? Should they really explain or do they have a different role?

Bell, P., Lewenstein, B., Shouse, A., and Feder, M.; *Learning science in informal environments: People, places, and pursuits*. National Academies Press 2009. Washington, D.C.

Bevan, B., Xanthoudaki, M.; *Professional development for museum educators*. Journal of Museum Education, 2008, 33(2), pp. 107-119

Gibbs, K., Sani, M., Thompson, J.; *Lifelong learning in Museums. A European handbook*. Edisai 2007. Ferrara (ITA)

Gregory, R. L.; *Editorial. Public perception of science*. Perception, 2000, 29, pp. 1273-1278

2.6 The human factor

In science museums and science centres all around the world, a whole host of explainers welcome and entertain the public in a variety of ways. Explainers are present in exhibition rooms, they answer or elicit the visitors’ questions, they explain how exhibits must be used. In the case of groups – school classes, typically – they take them fully on themselves and accompany them during the visit, or in structured educational activity areas. In educational labs, they carry out

demonstrations or organise experimental activities and follow their execution. On the occasion of festivals or exhibitions outside the museum, they are responsible for the flow of visitors and organize public performances, their job sometimes resembling that of jugglers or circus artists. They are often responsible for pointing out that an exhibit does not work and sometimes even for repairing it. There are explainers in science centres and museums of all kinds, but also in aquaria, botanical gardens, planetaria, centres inside nature parks, centres for scientific education etc. They are a homogeneous group in their being an interface between the public and the institution, though with different tasks, educational styles and contract conditions. They even have a number of names: explainer, interpreter, pilot, educator, demonstrator, presenter, enabler, interactor, host in English; animatore, guida scientifica, operatore didattico in Italian; and then there are educteur, médiateur, facilitateur, animateur (in French), demonstrator (in Slovene), edutainer, monitor (in Flemish), Museumführer, Moderatoren (in German), opas (in Finnish), monitor (in Portuguese), begeleider, suppoost, presentator (in Dutch), museilärare, teknoramavärd, museivärd, värd, museipedagogue (in Swedish), monitor, animador (in Spanish), vykladac, pruvodce, informator, lektor (in czechoslovakian), przewodnik, przewodnik muzealny, demonstrator (in Polish).

In some cases – small contexts, typically – explainers carry out all the aforementioned tasks and sometimes even some more, from selling tickets to repairing laboratory instruments. In other cases – larger contexts – different staff members take care of different activities: for example, skilled explainers plan educational laboratories, while less expert ones are present in exhibition rooms and guide tours.

Explainers can be permanent museum staff members, with full-time open-ended contracts, or they can be casual workers who are explainers as a second job. They can be students, volunteers and researchers who agree to meet the public upon special occasions.

In spite of these differences, an explainer is the human interface between the museum and the public. That makes his role crucial both from an educational point of view and from that of the welcome. It is often partly due to the charm and communication skills of an explainer if a school visit proves successful and leaves students enthusiastic about it. Complex objects or exhibits, or exhibitions about current scientific research dealing with particularly difficult subjects, become comprehensible and appealing because the explainer succeeds in operating as a direct intermediary between the knowledge contained in the object or exhibit and the visitor's personal learning. In open-air performances such as festivals, that invade different city areas with their initiatives - frequently rather far away from each other -, explainers are the evident signature of the performance, its recognizable brand.

The explainers are essential - yet sometimes these professional figures are underpaid, little considered or undertrained. However, their professional situation is not generally known and certainly not written about a great deal in international literature. There are data on how many explainers there are, who they are (age, gender, background) and what training they receive. But these data are limited. A generalization of the characteristics of explainers is consequently difficult. Very few studies have dealt with the meaning of their communicative role or have tried to determine its impact. One of the goal of the Pilots project is to gather more reliable data for the European situation.

Alfonsi L. (2005). *Literature review. Jcom*, 4(4)

Bailey E.B. (2006). *Researching Museum Educators' Perceptions of their Roles, Identity, and Practice*. In: BAILEY E.B.(ed), *The professional relevance of Museum Educators. Perspectives from the field. Journal of Museum Education*, 31(3): pp.175-197

Bevan, B., Xanthoudaki, M.; *Professional development for museum educators. Journal of Museum Education*, 2008, 33(2), pp. 107-119

Gomes da Costa A. (2005). *Should explainers explain?*. Jcom 4(4).

Henry B. (2006). *The educator at the Crossroads of Institutional Change*. In: BAILEY E.B. (ed), *The professional relevance of Museum Educators. Perspectives from the field. Journal of Museum Education* 31(3): pp. 233-241

Johnson C. (2005), *Training science center Explainers. The Techniquiest experience*. Jcom 4(4)

Kos M. (2005). *Who are the Explainers? A case study at the House of Experiments*. Jcom 4(4)

Massarani L., Rodari P., Merzagora M. (eds) (2007). *Diálogos & Ciência, Mediação em museus e centros de ciência*: Museo da Vida, Rio de Janeiro

Love Rodgers A. & Kelly, B. (2001). *A Survey on explainer Management in Interactive Centres*. BIG, settembre 2001
http://www.big.uk.com/knowledgebase/centres/download/explainer_report.pdf

Marino M. & Koke J. (2003) *Face to Face: Examining Educational Staff's Impact on Visitors*. ASTC Dimensions January/February.

Quin M. (1990). *The exploratory pilot, a peer tutor?*. In: Goodland S. & Hirst B. (eds). *Peer Tutoring*. Blackwell Education, London

Rodari P. & Xanthoudaki M. (2005a). *Beautiful guides. The value of explainers in science communication*. Jcom, 4(4)

Rodari P., Merzagora M., Conti F., Manzoli F. (2006). *Beautiful guides - the role of professional explainers and young scientists in science and society dialogue*. Proceeding of the PCST-9, 2006, Seoul (Korea), 17-19 May.

Tran, L. U. & King, H. (2007) *The professionalization of Museum Educators: The Case in Science Museum*. Museum Management and Curatorship, 22(2) pp.131-149.

Tran, L. U. *Professionalization of educators in science museums and centers: Towards a shared language*. In: Merzagora, M. & Rodari, P. (eds) (2007). *Dotik! Contact! The role of museum explainers in the dialogue between science and society*, in preparation

Väkeväinen M. (2005). *Volunteers as explainers at the Finnish Science Centre Heureka*. Jcom 4(4).