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pencil

Permanent EuropeAN resource Centre for Informal Learning

Structuring the European Research Area

Science & Society – European Science Education Initiative

Specific Support Actions

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WP26: INTEGRATION WITH NUCLEUS

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1. Executive Summary

The deliverable focused on the criteria for innovation relating to ICT use in education. The objective of the deliverable is to assess the use of ICT in the Pilot Projects (PP) and the way new techniques involving ICT to create new science teaching practices were used by the PP.

Fourteen PP have been implemented across Europe to create new initiatives linking informal and formal science teaching. The deliverable will first focus on a detailed evaluation of two PP. The first one is the project that was held by the National Marine Aquarium in United Kingdom called 'Marine issues with climate changes' and the second one is the project of the Nemo Sciences Centre of Netherlands called "Science Centre at school". Then, we will make a more general overview of the use of ICT in the other PP.

The desired outcome of the PP involved a large range of new teaching practices and/or new ways to tackle scientific subjects in schools. The projects had a number of compulsory conditions to respect in order to be part of "Pencil". The core was a science centre/museum that gathered a number of schools, teachers associations, laboratories, authorities and professionals in science communication and education.

They needed to have a clear goal for experimenting, either a new technique or a scientific topic and an international dimension.

2. Methodology

Critical input and background documents used for this evaluation have been provided by the Insight team, a research team within European Schoolnet focusing on evaluating ICT in education activities. The framework used to manage this evaluation was developed as part of P2P project¹. It brings together standards and indicators used by several education inspectorates throughout Europe, it revises and reorders these criteria and present them as one shared model.²

The framework is divided in three main themes: Conditions, Use and Outcomes. Each theme contains a numbers of quality areas. Quality indicators with responding evidence pointers are identified within each quality area. The conditions, use and outcomes are outlined in box 1 below.

¹ P2P is the Peer reviews and Observatory on Policy and Practice in ICT, a project led by European Schoolnet and funded by the European Commission's DG for Education and Culture. The purpose of the project was to aggregate and expand existing activities related to identifying, sharing and transferring excellence in the policy and practice of e-learning in school systems at regional, national and European levels.

² To find the Original Framework see Insight Portal:
http://p2p.eun.org/ww/en/pub/insight/minisites/p2p/p2p_home.htm

This framework was created to assess ICT use in schools but it has been adapted to the context of science teaching and learning using ICT. High quality ICT settings, use and outcomes typically go hand in hand with innovative educational practice in the use of ICT³, and also have demonstrable impact on student achievement, in particular in basic skills, science and to some extent in mathematics⁴. Teachers with a good experience of using ICT are more collaborative, project-oriented and experimental in terms of teaching methods.

Box 1: Conditions, use and outcomes

Conditions:

C1. Leadership

Clear vision for the use of ICT
Strategy to realise the vision

C2. Infrastructure and access

The available resources reflect the needs and vision of the project
The deployment of ICT resources supports effective learning

C3. Curriculum planning

Meeting local, regional and national requirements
Coherence, balance and consistency

C4. Quality assurance and improvement

Reviews and self evaluation about the use of ICT during the project

Use:

U1. Members use

Development of ICT skills
Enhancement of learning

U2. The teaching process

Use of ICT to enhance science teaching
Staff competence and confidence

U3. Administrative use

Communication is supported

³ 'The ICT Impact Report: A Review of Studies of ICT Impact on Schools in Europe', European Commission / European Schoolnet, 2007

⁴ 'Are students ready for a technology rich world? What PISA studies tell us.' OECD, 2004

Outcomes:

O1. Impact of learning and standards

Gains in broad learner achievement

In this deliverable, we will first apply the conditions, use and outcomes to the Pencil project as a whole. We then consider two specific pilot projects in detail: marine issues with climate change (NMA) and science centres at school (NEMO). We then give a summary overview of all pilots of Pencil in terms of the P2P framework.

3. Overall Pencil review

3.1 Conditions

C1. Leadership

The Pencil project as a whole provided a clear strategy for the use of ICT in the project via the initial project proposal which then became the work programme of the project. This work programme included a number of work items which further developed the strategy, including the development of a plan for the Pencil portal. This plan was then implemented during the two years of the project.

The results of the portal – the chief ICT-based output of the project – were reviewed in concertation with teachers and project partners during the later stages of implementation. Annex B shows the results of the initial survey of educators regarding the Pencil portal. Following this review, a revamped design was launched, aiming to improve usability and thus more effectively serve the needs of educators. An ongoing survey has been kept in place since the relaunch of the portal, available in English⁵, French⁶ and German⁷.

C2. Infrastructure and access

The Pencil project was ambitious in terms of providing an EU level infrastructure for sharing of science resources. On one hand it was successful, as the portal now provides a critical mass of science materials available in many languages, as well as indexing and linking effectively to pilot project results and outputs. One initial idea however was not finally achievable: the federation of resource repositories held by museums.

This was unfeasible technically speaking as museums do not have in-house technical staff, but typically rely on outsourcing of technical services. This means that their services were not standardised, and were thus nearly impossible to federate without significantly increased technical resources. However, the resources produced by museums were instead published or indexed manually via the ICT tools of the Xplora portal and the Xplora Knoppix DVD.

As indicated in C1, the initial portal – although the content was widely praised and well received – was not entirely suitable from a usability perspective, particularly for the chosen target group of teachers. Thus, changes were made to

⁵ <http://www.zoomerang.com/survey.zgi?p=WEB225UMN7LGXG>

⁶ <http://www.zoomerang.com/survey.zgi?p=WEB225UMP5LHHS>

⁷ <http://www.zoomerang.com/survey.zgi?p=WEB225UMNHLH5K>

ensure it was more useful for teaching and learning purposes.

In the case of the DVD ROM, as project content and results evolved, a new edition was required. Two editions of the DVD ROM were made during the project lifetime. The DVD ROM was particularly useful for schools without good access to the web as it provided a critical mass of content which could be accessed locally via any PC.

C3. Curriculum planning

The project itself was targeted at EU level, and thus it is nearly impossible for any EU service to meet all local, regional and national requirements, bearing in mind that there are a huge number of local curricula and standards across the member states.

The Xplora teacher panel was brought in to ensure that content plans for the web portal were appropriate for their own national contexts. The teachers chosen were from a variety of scientific backgrounds to ensure balance in the choice of scientific topics.

On another level, the Pencil pilots themselves were typically linked to the needs of local teachers, which reflect the national and local standards and curricula. The content of the pilots was highly diverse to ensure coverage of a balanced range of scientific topics.

C4. Quality assurance and improvement

The Pencil project included the following quality assurance, self-review and improvement mechanisms regarding use of ICT:

- The initial Pencil portal plans for Xplora were discussed among all project partners and validated via discussion by the Xplora teacher panel;
- The portal was discussed on a regular basis, with a mechanism put in place for partners to give detailed feedback on technical issues / difficulties they faced via a reporting template;
- The project work plan included two releases of the portal, with the second release being informed by the results of the first via analysis of web statistics and feedback from project partners and educators;
- Two surveys were put in place to gather feedback from educators on the Xplora portal (see C1 above).

3.2 Use

U1. Members use

The Pencil project developed the skills of various actors throughout the project. The main actors that were concerned were the project partners themselves, teachers engaged in the Xplora panel and teachers / educators attending project conferences and training sessions.

In the case of project partners, training sessions were organised as part of partner meetings to ensure that they could upload content to the Xplora portal using European Schoolnet's content management system, Contens⁸. They were also trained to use and access the resource upload and management tool, so that they could contribute links and files to the resources repository of the Xplora portal. The teacher panel received similar training so they might contribute content. In addition, both groups were informed about good style for creating content for the web, so as to adhere to good practice when adding new content to the portal. Both groups also gained knowledge of ICT via experiential informal learning: interacting with the portal, Pencil project and related tools encouraged them to develop new ideas and skills in terms of ICT for science education.

U2. The teaching process

Several ICT-based approaches were proposed for enhancing science teaching. The principle strategies were:

- Xplora web portal: a whole range of resources and support for teachers was provided through the portal. These included a resource database (for teaching kits, worksheets, practical lab protocols, simulations, etc.), specific practical examples written by teachers explaining their use of ICT in different contexts, guidance on using open source software, etc.
- Xplora Knoppix DVD: a similarly wide range of resources provided in a DVD ROM, enabling teachers without a reliable internet connection to access a critical mass of content provided via the portal, with the addition of a large number of open source software for different sciences (e.g. mathematics, general science, science at primary level, etc.).

Staff competence and confidence was chiefly addressed through the two Pencil conferences^{9,10} organised by European Schoolnet provided extensive training

⁸ <http://www.contens.de>

⁹ http://www.etwinning.net/ww/en/pub/xplora/events/calendar/scienceteachers_confer.htm

¹⁰ http://www.xplora.org/shared/data/xplora/pdf/Pencil_Science_Teachers_Conference_2007-Programme.pdf

opportunities for teachers and science educators in museums. These two conferences comprised a large number of workshops on specific topics relating to both ICT and the teaching and learning of science. Workshops were organised on the Xplora portal itself and how to use it, the Xplora-Knoppix DVD ROM (how to access and use resources and open source software for science teaching), open source software in science, web experiments (also known as remote controlled laboratory tools), use of new media in science, science and ICT in developing countries, creating online courses for science in the tool Moodle and many more. Many of these tools and topics are rather cutting edge and innovative in nature. For instance, in the case of web experiments, there are only two known instances of web experiments for school level education (all other documented cases are focused exclusively on tertiary level).

In addition, an online training platform, Moodle¹¹, was provided by European Schoolnet and INDIRE. A screenshot is provided below. The platform was populated with a number of self-learning courses created by INDIRE and the Xplora teacher panel.

The courses include:

- How to use the Xplora portal
- Astronomy in the online classroom
- Analysis of data using open source software
- Mathematics
- Complex Systems
- Science and Society
- Experimental sciences
- Mathematics 101.

¹¹ <http://moodle.eun.org/xplora/>

U3. Administrative use

The Pencil project leveraged ICT tools for administration of the project itself and organisation of activities with teachers.

For the project itself, the Pencil partners relied on the European Schoolnet community tool¹². A Pencil-specific community¹³ was set up including all project partners as members. This tool was chosen as at the stage of project inception, the Xplora portal community tools were not yet developed. The community tool was used for:

- Sharing key documents;
- Collecting project information and resources;
- Stimulating discussion between Pencil partners.

Some Pencil project activities required feedback from teachers via responses to survey questions (e.g. for understanding user needs in relation to developing portal

¹² <http://community.eun.org>

¹³ http://community.eun.org/entry_page.cfm?area=1686

content). The project relied on a commercially-provided survey tool, called Zoomerang¹⁴. This tool facilitated project administration as it provides:

- Easy set up of surveys based on existing survey layouts
- Customisation of survey templates to match project branding
- Email invitations to survey respondents
- Automatic collation of results
- Basic statistical outputs (i.e. frequency distributions, tables of results)

The figure below demonstrates a survey put in place via Zoomerang.

xplora
EUROPEAN SCIENCE EDUCATION

Xplora Portal Survey

Questions marked with an asterisk (*) are mandatory.

1 *You are a:

- Teacher
- Student
- Parent
- Researcher
- Journalist
- Science Communicator
- Other, please specify

2 If you are a teacher, at which level do you teach?

- Kindergarten and pre-school
- Primary school
- Secondary school
- Post secondary
- Other, please specify

3.3 Outcomes

¹⁴ <http://info.zoomerang.com/>

O1. Impact of learning and standards

The Pencil project – being only 3 years in duration – is too short to measure the medium-term impact of the project in terms of learning and standards in pupils. As the chief objective of the project was to support teachers in changing their pedagogical practice with relation to science teaching, the primary measurements were targeted at teachers.

To find demonstrable impact on student achievement, it would be necessary to implement a cohort study comparing the results of students whose teachers have been engaged in Pencil against those who have not. However, it would be difficult to attribute results specifically to Pencil, as motivated teachers typically engage in a range of projects and training activities to upgrade their skills.

However, as pointed out in the introduction to this report, there is some evidence that ICT based methods have an impact on student learning, in particular in basic skills, science and to some extent in mathematics¹⁵. There is also some evidence that ICT has a particularly good impact on science and technology achievement at primary school level¹⁶. Teachers with a good experience of using ICT are more collaborative, project-oriented and experimental in terms of teaching methods. Indeed, it is arguable that ICT is more critical to science and technology education than other areas: currently, vocational educators in this field are among the most dedicated users of ICT in the teaching profession.¹⁷

Further impacts of Pencil on learning and science education in general are considered in other Pencil project deliverables.

¹⁵ 'Are students ready for a technology rich world? What PISA studies tell us.' OECD, 2004

¹⁶ 'ImpaCT2: The Impact of Information and Communication Technologies on Pupil Learning and Attainment', Harrison, 2002

¹⁷ 'Benchmarking Access and Use of ICT in Schools', Empirica, 2006

4. Detailed cases

4.1 “Marine issues with climate change” (National Marine Aquarium, UK)

Conditions:

C1. Leadership

The National Marine Aquarium has not particularly developed a clear vision of the use of ICT related in an official document. The vision of ICT has not been reviewed regularly either. The ICT strategy (website for the project) has been designed at the initial phase of the project for the all project life-time. As it is a Pilot Project for a defined duration, it did not require regular revision. However, the NMA web pages as a whole are regularly reviewed and updated in relation to feedback from teachers.

C2. Infrastructure and access

The aim of the project was to increase the provision for educators to address the difficulties experienced in engaging young people with science. To reach this objective, the National Marine Aquarium (NMA) has created a Website called “Climate Lab”¹⁸. This resource is an interactive tool that aims to help younger people to appreciate the importance of reducing the effects of climate change. It aims to explain the pivotal role oceans play in climate change, while also empowering individual students to take action to minimize the effects of global warming. It has been designed in an interactive way to raise awareness among students about their role in climate change issues and to stimulate their interest in science.

Another objective was to provide climate change topics within formal teaching, for teachers to include in their curriculum.

To attain this goal, the PP needed to make resources available for the teachers to include climate change topics in their curriculum. The Website has been designed to be a teaching resource and to provide curriculum links for the teachers. The Lab is also a resource for a range of project ideas which use climate change as a springboard for discussion, investigation and learning. Teachers can find facts, ideas and resources to plan their lessons.

¹⁸ <http://www.climatelab.co.uk/>

The NMA made available suitable resources to reflect the needs and vision of the PP. Firstly, the internet resource (Climate Lab) meets needs of pupils and teachers regarding to the objectives identified at the beginning of the project.

Secondly, this resource is available for teachers at any moment as it is a Website hosted by the portal of the NMA.¹⁹

Do the deployment of ICT resources support effective learning?

The “Climate Lab” has different functions. It is an interactive learning object designed to stimulate the interest of the pupils for sciences and Climate change topics as well as a source of pedagogical tools and tips for the teachers. It also hosts a think tank aiming to make young people think about impact of the changing seas and oceans on themselves and the area where they live. This think tank is a meeting place for experts, school teams and staff of the NMA. As far as schools provide access for pupils and teachers to internet connections, the NMA provides a website designed for the project that is hosted by the NMA portal.

The internet resource enables teachers to have access to pedagogical resources designed by experts and scientists of the NMA from any place with an internet connection without needing to go to the NMA.

In conclusion, the deployment of ICT resources supports effective learning. Indeed, the internet resource created by the NMA supports different educational activities and is sufficiently accessible for learners, teachers and schools. ICT use in the context of this PP makes also learning more independent of place and time and encourages longer term impact of education activities taking place at the NMA. It also enables teachers and students who do not live near to the NMA to take advantage of their expertise.

C3. Education content planning

Does the project take into account the national requirements in terms of curriculum?

A new, more flexible, curriculum was being experimented during the 2006-2007 school year for the last three grades of secondary school in the United Kingdom. The reform has created the opportunity for school managers to add to the mandatory courses supplementary ones devoted to particular topics for school managers. This reform has given a great opportunity to the NMA to build new relationships with schools.

¹⁹ <http://www.national-aquarium.co.uk/>

Is use of ICT coherent, balanced and consistent according to target group age?

The “Climate Lab” has been designed in accordance of the target age group (10-15 aged pupils). The interactive learning object that the site provides were developed in an appropriate manner to the age of the target public their ability and previous learning as it relies on research into curriculum provision.

C4. Quality assurance and improvement

ICT use effectiveness in the PP has been frequently evaluated by the NMA staff which have planned regular reviews and self-evaluation about new technology use during whole project duration.

Use:

U1. Learners use

Does the use of ICT across the project enhance learning?

The think tank section of the “Climate Lab” is a meeting place where participating schools and colleges are invited to add their own thoughts and approaches in an ongoing development. Students can debate with others students and scientist from the NMA. The use of ICT in the NMA project enhances learning; it enables learners to use ICT to work in teams and with others in order to develop skills and to acquire expert knowledge. Internet resource of the project (the Climate Lab) stimulates an independent way to learn. The Website invites pupils to learn about climate change topics in an interactive way through a range of questions and information specially addressed to them.

NMA incorporated the design of games added to the physical Climate-Lab to increase engagement. Web designers have been working with a small cohort from two participating schools to develop the Website and paper-test games and activities. Learners are engaged and motivated by the use of ICT.

Does the project develop ICT skills among learners?

On the Think Tank of the “Climate Lab”, pupils have the possibility to create their own web page for their school Website. They are also invited to debate through a forum with other pupils and scientist in an interactive learning environment. These activities offer them the possibility to be familiarized with the web environment and to build a Website. The project develops ICT skills, more specifically internet skills, among learners.

U2. The teaching process

Does the use of ICT enhance science teaching?

The outcome of the PP needed to be new teaching practice and new ways to tackle scientific subjects in Schools in order to enhance teaching. To reach this objective, the PP staff used strategies including the creation of “Climate Lab”, the one-stop shop for teachers, pupils and science centres that deals with the topic of climate change. It is an innovative tool for education staff to teach science in Schools. We can conclude that the NMA include in its strategy the use of ICT, to enhance teaching.

Internet Resource is used in this project to increase authenticity and interactivity of education of science and more especially education about issues related to climate change. In fact the Lab hosts various interactive tools on subject like global warming, the research about climate change, the impact on oceans and the emission of CO₂, as many tools that increase the interactivity of science education.

The staffs also use internet resource to introduce multiple views, media and resources. For example the think tank includes various links to media Website talking about climate change like the BBC, CNN, the Guardian and the National Geographic. It also provides various views about this issue from scientist and organisations (WWF, Eur-Oceans, ExplorOcean ...) specialised in the field.

U3. Administrative use

Is communication of the project supported?

In the “Climate Lab” area dedicated to teachers, there are information about the project and the context in which it has been created. It also provides a link to Xplora portal where information about the network of PP and the description of the global project Pencil is available. The lab is also a communication tool. It is a meeting place for pupils, teachers and scientist through the think tank as explained above.

The communication of the project is supported except for the publication of policy briefs and newsletter on the Website.

Outcomes:

O1. Impact on science learning and standards

Are there gains in broad science learner achievement?

Is there an observable and documented transformation of science learning

practice?

The “Climate Lab” proposed a lot of ideas of project to teachers to develop in their classroom. These projects include activities using ICT (e.g. creation of database in the project called “An interactive geographical investigation”) that represent an evolution regarding to traditional ways to teach science at school. The think tank area of the Climate Lab also corresponds to an innovation in the way to learn science to pupils as learners are invited to involve on debates about climate change thanks to an internet resource. As reported in a previous deliverable (D22. Schools Network), the PP of the NMA has gathered a network of 16 schools across UK involving 20 teachers and 360 pupils. Therefore, the impact of the use of ICT on science learning produce by this PP has touched at least the 16 participating schools.

Nevertheless, as the PP were implemented recently, it is difficult to assess the impact of the use of ICT on science learning and teaching produce by the NMA project because the effects are observable in the long run. Trends over time are not appreciable at the moment. This explained the lack of documented report. However the deliverable 24 by Kings College reviews the impact of Pencil as a whole on science learning and teaching.

4.2 “Science Centres at Schools” (NEMO, Netherlands)

Conditions:

C1. Leadership

The Nemo PP formulated the vision for ICT in an official document to develop and realise it at all levels in the project.

C2. Infrastructure and access

Do the available resources reflect the needs and vision of the project?

The objective of this project was to make a SWOT analysis of existing hands-on science curricula for primary schools and cook-books from science centres from the USA, regarding their effectiveness in creating awareness and positive attitudes with pupils for R&D and stimulating pupils to conduct R&D themselves at a basic level. The aim is to set up an inquiry based model for science education in primary school.

In practice, the first step of the PP consisted in the construction of interactive exhibits by primary school classes of 11-12 years old pupils. The activity was scheduled for 8 half-day including one at the Nemo Science Centre.

The available ICT resource for the project consists in a Website²⁰ in Dutch and partly in English with two sections, one for primary level and the other for the secondary level. Each section is divided in a space for teachers and a space for pupils. It also contains information about the context in which the PP has been developed and about partner's organisations.

The Website contains all the resources needed by the teachers and the students to organise the school activity namely: advices, instructions, lesson materials, exhibits materials and tips & tools. Learning resources reflect learners and teachers needs.

Do the deployment of ICT resources through the project supports effective learning?

As far as pupils and teachers have an access to internet connections, Nemo Science Centre provides a Website designed for the project. Learning resources created by the Science Centre are made accessible for learners and teachers thanks to the Website. Providing resources for students on a web resource makes also learning more independent of place and time.

On one hand, the web resource supports effective learning because it makes learning resource accessible for the users of the project and independent of place and time. On the other hand, the support of effective learning could be improved with more interactive tools on the Website.

C3. Education content planning

Does the project take into account the national requirements in terms of curriculum?

The PP is part of the national context, in which the Dutch government is reforming the curriculum in order to introduce science and technology education. Nemo has been asked to play a leading role in this context.

The PP also takes into account the school agenda by scheduling the different phases of the PP in accordance with it. For example, the first pilot phase was planned to run before the February fundamental test which is crucial for determining future pupil educational path in the Dutch education system.

Is use of ICT coherent, balanced and consistent according to target group age?

²⁰ <http://www.sciencecenteropschool.nl/>

The target group age is 11-12 years old pupils. Nemo Science Centre has dedicated a space to the pupils on the Project Website. Texts and pictures have been chosen in order to explain to pupils how to organise the activity and to show experiences of pupils in other schools. ICT resources are designed for pupils in an appropriate manner according to their age, ability and previous learning.

C4. Quality assurance and improvement

Information not available

Use:

U1. Learners use

Does the use of ICT across the project enhance learning?

The space dedicated to pupils on the Website show them all the opportunities that the 'Science Centre at School' project offers. The Website provides detailed information about the activities they will do, the visit at the Science Centre and a large range of links to Website about Science.

The Website also provides lesson material in PDF format for pupils. It is the Work book for the pupils with all the information they need to create their exhibits at school.

The Internet resource of this project enhances learning because it aims to engage and motivate pupils to involve in the Project. It also enables pupils to connect learning inside and outside school thanks to Internet. On the contrary, the Website has not been used as a tool for pupils to work in team or to develop ICT skills. The main purposes are to provide information and material for the lessons and it doesn't include interactive tools or forum dedicated to pupils.

U2. The teaching process

Does the use of ICT enhance science teaching?

The outcome of the PP needed to be new teaching practice and new ways to tackle scientific subjects in Schools in order to enhance teaching. In this PP it has included the creation of the 'Science op school' Website that supports the school activities and brings an added value to the science teaching process in classroom. Project staff also used the internet resource to introduce multiple resources for teacher.

U3. Administrative use

Is Communication of the project supported?

As explained below, the Project include a Web-site online since 1st May 2006 that aims to give the necessary information for pupils and teachers to realize the exhibits at school. Materials and resources are available online for pupils and teaching staff from home. Newsletters are also available online. The project support Communication.

Outcomes:

O1. Impact on science learning and standards

Are there gains in broad science learner achievement?

Is there an observable and documented transformation of science learning practice?

The overall objective of the 'Science Centre at School' project was to include hands-on activities into the science curricula. The Project is part of a wider programme led in the Netherlands to include Science and technology in schools curricula. This represents a evolution regarding to science learning practice; information and results of the Project run by Nemo are transcribe on the Science Centre at school Website.

4.3. Overview - ICT use in Pencil Pilot Projects

For the nine other PPs, a more general evaluation has been conducted with the same evaluation framework. A questionnaire²¹ was distributed to PP staff with the request to answer has briefly as possible (most of the time Yes/No was sufficient). The objective was to make an overview rather than a detailed evaluation. The purpose was to create a table clearly showing the trends in ICT use in the whole Pencil PP.

Each question is related to one of the quality indicator of the framework used for this deliverable explained in the methodology.

Concerning the first theme, the general evaluation shows that few PP have

²¹ See annex A

implemented a clear **leadership** related in an official document to develop and realise a global vision for ICT. Only three PP have a positive answer for the criteria “Official document was formulating ICT use vision”. In most of the projects, ICT strategy (creation of a website) has been designed at the initial phase of the project for the all project life-time. Projects were planed for a defined duration and did not really require regularly revision. However, the projects were subject to a project level review via the deliverable xx from Kings College, and were included in a project-wide ICT approach (i.e. the Pencil portal and associated services e.g. DVD).

For the second theme, **infrastructure and resources** supporting teaching learning and administration, the majority of PP had available ICT resources reflecting the needs and vision of the PP. The evidence was a website dedicated to the project or a specific space for the PP on the Science Centre/Museum Website. An overall majority of PP used ICT resources to supports effective learning. ICT resources were used to support different educational activity (8 Yes and 1 No) and ICT was used make teaching resources accessible at locations distant from the physical pilots (7 Yes and 2 No).

Regarding **curriculum planning**, the evaluation shows that all the PP took into account the national requirement. This typically involved either links with local teachers, research by educational staff in the museums themselves, or via working with educational researchers.

For the fourth theme, **quality assurance and improvement**, a minority of PP had regular review and self-evaluation about the use of ICT (4 Yes and 5 No). However, all PPs were subject to the main project level review as mentioned earlier.

In terms of **Learner Use**, few PP used ICT to organise team activity for pupils (3 Yes and 6 No) but almost all of them used ICT to engage and motivate pupils (7 Yes and 2 No). This activity was probably suitable for the time period in which the project took place. However, in future, further learner use should focus on cooperative activities for pupils, especially bearing in mind the current evolution of web technologies (i.e. web 2.0 and social web phenomenon).

Concerning the **teaching process**, a majority of PP responds positively to the question related to use of ICT to increase authenticity and interactivity of teaching.

Finally, concerning **impact on learning and standards**, a majority of the PP didn't find an observable and documented transformation of Science learning practice. However, as the PP were implemented recently, it is difficult to assess the impact of the use of ICT on science learning and teaching because effects are observable

in the long run. Trends over time are not appreciable at the moment. This can explain the lack of documented report.

Science centre – Museum/ Quality criteria	C1.Leadership: Official document was formulating ICT use vision Question 1.	C1.Leadership: Vision was regularly reviewed Question 2.	C2.Infrastructures and resources a. Web-site dedicated to the PP b. a specific space for the PP on the Science Centre - museum Website	C2.Infrastructures and resources ICT resources support different educational activity Question 3.	C2.Infrastructures and resources Use of ICT to make teaching resources accessible Question 4.
National Marine Aquarium	No	No	Yes a. http://www.climatelab.co.uk/ hosted by the NMA website	Yes	Yes
Instituto e Museo di Storia della Scienza	No	No	Yes a. http://brunelleschi.imss.fi.it/pencil/index.html	Yes	Yes
Exploradôme	Not really	No	Yes b. http://www.exploradome.com/html/exploramobile/	Yes	No
Heureka	Yes , it is said in the contract that the main focus of dissemination is on web-based services	Yes , during the whole project.	No	Yes , we delivered the laboratory programmes via websites	Yes
NEMO	Yes	No	Yes a. http://www.sciencecenteropschool.nl/index.php?id=95	Yes	No
Deutsches Museum	No	No	Yes b. http://www.deutsches-museum.de/forschung/projekte/permanent-european-centre-for-informal-learning/	Yes	Yes
Experimentarium	No	Yes	No	Yes	Yes
Bloomfied Science Museum	Yes	Yes	No	Yes	Yes
Universeum/Teknikens Hus	No	No	No	No	Yes , documents were uploaded on the Xplora website to provide teachers with examples and inspirational activities

Science centre/ Museum	C3. Curriculum planning national requirements taken into account Question 5.	C4. Quality assurance & improvement Reviews and self evaluation Question 6.	U1. Learner use ICT use by pupils to work in team Question 7.	U1. Learner use Use of ICT to engaged and motivated pupils Question 8.	U2. Teaching process ICT used to increase authenticity and interactivity of teaching Question 9.	U3. Admin. use Communication is supported Web-site containing information for participants	O1. Impact on ICT learning and standards Observable & documented transformation of science learning practice Question 10.
National Marine Aquarium	Yes	Yes	Yes	Yes	Yes	Yes , the PP website contains global info about Pencil project	No
Instituto e Museo di Storia della Scienza	Yes	No	No	Yes	Yes	Yes , the PP website contains global info about Pencil project	No
Exploradôme	Yes , of course	Yes	Yes	Yes	Yes	Not really , except for a link to Pencil website	YES that was the key point of our PP
Heureka	Yes , the national curricula were taken into consideration	No	No	No	Not really	No	No
NEMO	Yes	No	No	Yes	No	Not really , except for a link to Pencil website	No
Deutsches Museum	Yes	No	N/A	Yes , ICT was used as a tool, so it was used to engage	N/A	Yes , the DM web site contains global info about Pencil project	N/A
Experimentarium	Yes	Yes	No	Yes	Yes	No	No
Bloomfied Science Museum	Yes	Yes	No	Yes	Yes	No	Yes

Universeum/Teknikens Hus	Yes , The curriculum is the basis for the design of the project	No	Yes , in some of the schools they used ICT to work in teams	No	No	No	No
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Annex A: Questionnaire - Criteria of innovation in the Pilot Projects

Questions:

1. Did you have an official document formulating the vision of the use of ICT in the PP?
2. Did you regularly review the vision of the use of ICT?
3. Did you use ICT to support various educational activities?
4. Did your project use ICT to provide teaching resources to the teachers involved in the project?
5. Does the project take into account the local, regional and national requirements in terms of curriculum?
6. Did you plan regular reviews and self evaluation about the use of ICT in the PP during the project life time?
7. Was ICT used for pupils to work in teams?
8. Did you use ICT to engage and motivated pupils?
9. Did you use ICT to increase authenticity and interactivity of science teaching?
10. Did your project include activities using ICT that represent an evolution regarding to traditional ways to teach science at school?

Table – Evaluation

Quality Areas	Indicators	Evidences	Answers
C1.Leadership	Clear vision for the use of ICT in the PP	<ul style="list-style-type: none"> - Official document was formulating ICT use vision - Vision was regularly reviewed 	<p>1-</p> <p>2-</p>
C2.Infrastructures and areas	Available ICT resource reflects the needs and vision of the PP	<ul style="list-style-type: none"> - Web-site dedicated to the Project - Interactive tools for pupils host by the Web-site - ICT resources for teaching 	
	Deployment of ICT resources supports effective learning	<ul style="list-style-type: none"> - ICT resources support different educational activity - ICT resources are sufficiently accessible for pupils - Use of ICT to make teaching resources accessible 	<p>3-</p> <p>4-</p>
C3.Curriculum planning	Meeting national requirement	<ul style="list-style-type: none"> - The PP takes into account the national requirements in terms of curriculum 	5-
C4.Quality assurance and improvement	Evaluation of the effectiveness of ICT in the project	<ul style="list-style-type: none"> - Regular reviews and self evaluation 	6-
U1.Learner use	Enhancement of learning	<ul style="list-style-type: none"> - Use of ICT to enhance learning - ICT was use by pupils to work in team - Use of ICT to engaged and motivated pupils 	<p>7-</p> <p>8-</p>
U2.Teaching process	Use of ICT to enhance teaching	<ul style="list-style-type: none"> - ICT was used to increase authenticity and interactivity of teaching - Project staff used ICT to introduce multiple views, media and sources 	9-
U3.Administrative use	Communication is supported	<ul style="list-style-type: none"> - A web-site for the project, containing information for participants - ICT used for schools, teachers and pupils to communicate with other 	

		- Resources available online - Newsletters online	
O1.Impact on learning and standards	Gains in broad science learning and standards	- Observable and documented transformation of science learning practice	10-

Annex B: Initial portal survey results (English only)

Xplora portal survey English Version

Results Overview



Date: 1/25/2008 3:02 AM PST
 Responses: Completes
 Filter: No filter applied

1. You are a:

Teacher		26	46%
Student		0	0%
Parent		2	4%
Researcher		7	12%
Journalist		1	2%
Science Educator		8	14%
Other, please specify		13	23%
Total		57	100%

2. If you are a teacher, at which level do you teach?

Kindergarten and pre-school		1	3%
Primary school		7	21%
Secondary school		20	61%
Other, Please Specify		5	15%
Total		33	100%

3. How did you find Xplora?

Search Engine (eg. Google)		0	0%
Link from another site		10	18%
Via a National Education Website		6	11%
Informational email or newsletter		14	25%
Link from the European Commission Website		7	12%
Print publication		1	2%
Other, please specify		19	33%
Total		57	100%

4. How often do you visit the Xplora site?			
All the time - it is my start-up page		1	2%
Every day		6	11%
Every week		20	35%
Sometimes in a month		21	37%
Less than monthly		9	16%
Total		57	100%

5. How likely are you to return in the next 30 days?			
I will return		49	86%
I will not return		3	5%
Not sure		5	9%
Other, please specify		0	0%
Total		57	100%

6. What is your main reason for visiting our site? (you can choose more than one answer)			
to gather information about science		21	37%
to read articles and texts		25	44%
to collect information about science lessons and educational activities		19	33%
Using the database to download or upload resources		19	33%
Free educational materials		18	32%
Materials fitting the curriculum		7	12%
Use the Xplora Community		22	39%
Native language support		1	2%
Support in cooperation		6	11%
Curious		13	23%
Other, please specify		7	12%

7. Are you registered as a member on the Xplora site?			
Yes		38	67%
No		19	33%
Total		57	100%

8. What do you think about the overall design or appearance of Xplora?			
Innovative and creative		16	28%
Good		25	44%
Simple and easy to navigate		1	2%
Hard to understand		15	26%
Total		57	100%

9. Which of the following adjectives would you choose to define Xplora's colours and graphics? (you can choose more than one answer)			
Lively		16	28%
Original		22	39%
Fascinating		6	11%
Complicated		10	18%
Simple		6	11%
Tricky		3	5%
Strange		5	9%
Innovative		18	32%
Old fashioned		2	4%
Other, please specify		7	12%

10. What do you think of the Xplora home page?			
Creative and fascinating: really related to science!		11	19%
Nice: I like these planets in movement		20	35%
Quite nice but a bit more text would be better		4	7%
A little bit difficult, at first sight		15	26%
Not really good: I can't understand what the site is about		7	12%
Total		57	100%



11. What do you think about the navigation on the Xplora website?			
Very easy and simple		5	9%
Easy, you can find all the information you need		17	30%
Quite easy, but sometimes I don't know how to find some sections		21	37%
Not very easy, you don't know where you are		9	16%
Not easy at all		5	9%
Total		57	100%


12. How quickly would you say the pages load?			
Very fast		5	9%
Fast		26	46%
Acceptable		19	33%
Slow		5	9%
Very slow		2	4%
Total		57	100%





















13. Do you find the texts on the Xplora website easy to read?			
Very easy		15	26%
Fairly easy		34	60%
Somewhat difficult		8	14%
Very difficult		0	0%
Total		57	100%

14. Which Xplora sections do you prefer? (you can choose more than one answer)			
Library		20	35%
Megalab		19	33%
Practice		15	26%
Events		9	16%
Community		22	39%
News		20	35%
Partners		6	11%
Museums		13	23%
Research Labs		13	23%
Nucleus		9	16%
EU Projects		12	21%

16. Do you like the organisation of the different content sections (eg. Library, Events...) on Xplora?			
Yes, it is very clear to me		9	16%
Yes, I find it quite well structured		26	46%
Some sections are too full of content		6	11%
The information structure is a little chaotic		7	12%
No, there are too many sections		1	2%
No, it is difficult to find some content within this structure		6	11%
Other, Please Specify		2	4%
Total		57	100%

17. Have you used the resource database in the Library section (http://www.xplora.org/www/en/pub/xplora/library/resources.cfm)?			
Yes		24	42%
No		33	58%
Total		57	100%
10 Responses			

18. Would you like to cooperate more closely with Xplora?			
Yes		43	83%
No		9	17%
Total		52	100%

19. If yes, please indicate which of the following are your topics at school:			
Art		7	18%
Biology		7	18%
Chemistry		7	18%
Citizenship		4	10%
Economics		2	5%
Environmental Education		13	33%
Ethics		3	8%
Foreign Language		6	15%
Geography		7	18%
History		4	10%
Informatics		13	33%
Language and literature		5	13%
Maths		10	26%
Media Education		7	18%
Music		4	10%
Natural Science		12	31%
Philosophy		2	5%
Physical Education		4	10%
Physics		18	46%
Politics		1	3%
Psychology		2	5%
Religion		3	8%
Social Sciences		6	15%
Social Studies		2	5%
Special Education		4	10%

19. If yes, please indicate which of the following are your topics at school:

Art		7	18%
Biology		7	18%
Chemistry		7	18%
Citizenship		4	10%
Economics		2	5%
Environmental Education		13	33%
Ethics		3	8%
Foreign Language		6	15%
Geography		7	18%
History		4	10%
Informatics		13	33%
Language and literature		5	13%
Maths		10	26%
Media Education		7	18%
Music		4	10%
Natural Science		12	31%
Philosophy		2	5%
Physical Education		4	10%
Physics		18	46%
Politics		1	3%
Psychology		2	5%
Religion		3	8%
Social Sciences		6	15%
Social Studies		2	5%
Special Education		4	10%