Allegato 1

Testo integrale del progetto INQUIRE
Inquiry-based teacher training for a sustainable future
(Project ID: 266616 - FP7-SCIENCE-IN-SOCIETY-2010-1 [SiS-2010-2.2.1.1]
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Il progetto si colloca all’interno del Seventh Framework Programme for research and technological development of the European Union FP7 - THEME [SiS-2010-2.2.1.1] - Supporting and coordinating actions on innovative methods in science education: teacher training on inquiry based teaching methods on a large scale in Europe.
Project Number: 266616

Project Title:

*Inquiry-based teacher training for a sustainable future*

Project short name: INQUIRE

Name of coordinating person:

DR. SUZANNE KAPELARI
Suzanne.Kapelari@uibk.ac.at

### List of Participants:

<table>
<thead>
<tr>
<th>Part. No</th>
<th>Participants Organisations Name</th>
<th>Start</th>
<th>End</th>
<th>Country</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>University of Innsbruck (LFU)</td>
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<td>National Botanic Garden of Belgium (NBGB)</td>
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<td>M36</td>
<td>Belgium</td>
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<td>10.</td>
<td>Schulbiologisches Zentrum Hannover (SBZH)</td>
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<td>M36</td>
<td>Germany</td>
</tr>
<tr>
<td>11.</td>
<td>Jardín Botánica de la Ville de Bordeaux (BORD)</td>
<td>M1</td>
<td>M36</td>
<td>France</td>
</tr>
<tr>
<td>12.</td>
<td>Coimbra Botanic Garden (FCTUC)</td>
<td>M1</td>
<td>M36</td>
<td>Portugal</td>
</tr>
<tr>
<td>13.</td>
<td>Moscow State University Botanical Garden (MSU)</td>
<td>M1</td>
<td>M36</td>
<td>Russia</td>
</tr>
<tr>
<td>14.</td>
<td>Natural History Museum, Botanical Garden (NHM)</td>
<td>M1</td>
<td>M36</td>
<td>Norway</td>
</tr>
<tr>
<td>15.</td>
<td>Botanischer Garten, Rhododendron-Park, botanika Bremen (BGRHB)</td>
<td>M1</td>
<td>M36</td>
<td>Germany</td>
</tr>
<tr>
<td>16.</td>
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<td>M1</td>
<td>M36</td>
<td>Spain</td>
</tr>
<tr>
<td>17.</td>
<td>University of Lisbon (UL)</td>
<td>M1</td>
<td>M36</td>
<td>Portugal</td>
</tr>
</tbody>
</table>
Table of Content:

B.1. Concept and objectives, quality and effectiveness of the support mechanisms and associated work plan ........................................... 4
  B.1.1. Concept and objectives .................................................................................................................................................. 4
  B.1.2. Quality and effectiveness of the support mechanisms and associated work plan ................................................................. 6

Project base line: .............................................................................................................................................................................. 8
  B.1.2.1. Introducing IBSE in formal and informal settings on a large scale ................................................................. 9
  B.1.2.2. Snowballing best practice pedagogical approaches through practitioner training ......................................................... 10
  B.1.2.3. Establishing a key network for the renewal of science education .................................................................................... 11
  B.1.2.4. Offering front-line support to teachers and informal educators to practice IBSE ............................................................. 11

B.1.2.5 Using IBSE to engage young people in a scientific discourse about biodiversity conservation and climate change...................................................................................................................................... 12
  B.1.2.6. Bridging the gap between educational researchers and practitioners ........................................................................ 13
  B.1.2.7. Supporting the development of Europe wide standards for evaluating formal and informal education programmes ........................................................................................................................................... 14
  B.1.2.8. Making the case for inquiry and context based learning ................................................................................................. 14
  B.1.2.9. Examining the implementation of curriculum based innovations ...................................................................................... 14
  B.1.2.10. Stimulating and motivating science learning from the earliest stage ............................................................................ 15
  B.1.2.11. Increasing self-confidence in girls to study science ................................................................................................. 16
  B.1.2.12. S/T Methodology and associated work plan ............................................................................................................ 16

WT1 List of work packages .................................................................................................................................................................. 27
WT2 List of Deliverables ..................................................................................................................................................................... 28
WT 4 List of Milestones .................................................................................................................................................................... 29
Work package 1:.............................................................................................................................................................................. 41
Work package 2:.............................................................................................................................................................................. 43
Work package 3:.............................................................................................................................................................................. 45
Work package 4:.............................................................................................................................................................................. 47
Work Package 5:.............................................................................................................................................................................. 49
Workpackage 6 .............................................................................................................................................................................. 51
Work package 7:.............................................................................................................................................................................. 53
Work package 8:.............................................................................................................................................................................. 55
Work package 9:.............................................................................................................................................................................. 57
WT 6 Project effort by beneficiaries and work package .................................................................................................................... 59
Graphical presentation (Pert diagram) ............................................................................................................................................. 60

Significant risks and associated contingency plan .......................................................................................................................... 61

B.2. Implementation

B.2.1. Management structure and procedures ................................................................................................................................ 63
  B.2.1.1. The Management Board ............................................................................................................................................... 63
  B.2.1.2. Quality Management (QM) ........................................................................................................................................ 64
  B.2.1.3. Dissemination Management (DM) ................................................................................................................................ 64
  B.2.1.4. Project Coordinator (PC) ............................................................................................................................................. 65
  B.2.1.5. Workpackage Leaders (WP Leaders) .............................................................................................................................. 65
  B.2.1.6. IBSE Expert Consortium ................................................................................................................................................ 66
  B.2.1.7. Advisory Groups (AG) ................................................................................................................................................. 66
  B.2.1.8. Consortium Partner (LOTIC Institution) .......................................................................................................................... 67
  B.2.1.9. Communication flow ...................................................................................................................................................... 68
  B.2.1.10. Evaluation Process ...................................................................................................................................................... 68

B.2.2. Beneficiaries ......................................................................................................................................................................... 70
  B.2.2.1. University of Innsbruck, Institute of Botany, Austria (LFU) .......................................................................................... 70
  B.2.2.2. Botanic Garden Conservation International (BGCI) ........................................................................................................ 71
  B.2.2.3. King’s College London University (KOL) ......................................................................................................................... 72
  B.2.2.4. Museo Tridentino di Science Naturali, Trento, (MTSN) .................................................................................................. 73
  B.2.2.5. Royal Botanic Gardens Kew (KEW) .................................................................................................................................. 74
B.1. Concept and objectives, quality and effectiveness of the support mechanisms and associated work plan

B.1.1. Concept and objectives

‘We cannot solve our problems with the same thinking we used when we created them.’
Albert Einstein

The overall objective of the INQUIRE project is the widespread uptake of inquiry-based teaching and learning in science education across Europe. With this in mind, the overwhelming goals of the INQUIRE project are the following:

<table>
<thead>
<tr>
<th>Summary Table</th>
<th>Work packages addressing this issue</th>
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<tr>
<td><strong>INQUIRE</strong> will link informal and formal education systems as well as the science education research community through assembling an interdisciplinary project team</td>
<td>WP2 Levelling</td>
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<tr>
<td><strong>INQUIRE</strong> will develop a shared understanding of inquiry based learning in formal and informal educational institutions on a European scale</td>
<td>WP2 Levelling</td>
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<tr>
<td><strong>INQUIRE</strong> will develop a rolling one-year training course for practitioners in inquiry-based learning (INQUIRE course manual) Addressing pupils age 9-14 years</td>
<td>WP3 INQUIRE course development</td>
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<td><strong>INQUIRE</strong> will promote already existing best practise models (PLASCIGARDEN, SINUS Transfer, POLLEN; S-TEAM, FIBONACCI) throughout the project in both the formal and informal education system</td>
<td>WP3 INQUIRE course development WP6 Dissemination</td>
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<tr>
<td><strong>INQUIRE</strong> will develop a course whose subject content will highlight the major global issues of the 21st Century: biodiversity loss and climate change</td>
<td>WP3 INQUIRE course development</td>
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<td><strong>INQUIRE</strong> will promote learning in and outside the classroom</td>
<td>WP3 INQUIRE course development</td>
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<tr>
<td><strong>INQUIRE</strong> will promote its course through the various national systems that support continual professional development for teachers</td>
<td>WP4 Implementation</td>
</tr>
<tr>
<td><strong>INQUIRE envisages to</strong> implement pilot courses a local level throughout 11 European countries</td>
<td>WP4 Implementation</td>
</tr>
<tr>
<td><strong>INQUIRE</strong> will ensure that formative assessment encourages the course design to be adapted to the needs of individual countries</td>
<td>WP7 Quality Management</td>
</tr>
<tr>
<td><strong>INQUIRE</strong> will create an interactive website and regularly published electronic newsletters to support a practitioners network</td>
<td>WP6 Dissemination</td>
</tr>
<tr>
<td><strong>INQUIRE</strong> will train teachers and informal educators to carry out their own practitioners research</td>
<td>WP4 Implementation</td>
</tr>
<tr>
<td><strong>INQUIRE</strong> will encourage teachers and educators to participate in website activities through establishing a teacher recognition scheme</td>
<td>WP3 INQUIRE course development</td>
</tr>
<tr>
<td><strong>INQUIRE</strong> will run a final Conference to disseminate the project outcomes on a European wide scale</td>
<td>WP6 Dissemination</td>
</tr>
</tbody>
</table>
The Goal

INQUIRE aims to reinvigorate inquiry-based science education (IBSE) in the formal and the Learning Outside the Classroom’ (LOtC) educational systems throughout Europe. INQUIRE envisages to promote the professional development of teachers by implementing effective teacher training interventions using the expertise in inquiry-based learning and teaching of a consortium of 17 partners in 11 countries.

The consortium will develop and is planning to implement a rolling one-year training course for practitioners in inquiry-based learning methods, research methodology and assessment techniques. Through training, ongoing mentoring and promotion of best practice, INQUIRE will try to firmly embed this pedagogy within the educational systems of 11 European countries.

The subject content of the course will focus on the major global issues of the 21st Century: biodiversity loss and climate change and will build on already published teaching resources (PLANTS CAFE; POLLEN; SINUS Transfer, S-Team, Biology in Context, etc) as well as on newly created resources.

Plants are the basis for all life on earth and it is critical for a sustainable future that students and teachers understand the fundamental importance of plants to our lives. IBSE allows learners to critically explore inter-connections between subjects, which is an important tool in the development of fully informed citizens that play an active role in democracy.

Botanic gardens and science education researchers, with their practical as well as theoretical expert knowledge in this field, will mainly facilitate the course development and implementation.

LOtC is known to increase learners’ motivation to continue with their studies about science. Research into LOtC demonstrates clearly that learners develop their knowledge and skills in ways that add value to their everyday experience in the classroom. Research also shows that some experiences have a particularly positive impact on long-term memory. Out-of-class learning reinforces the link between the affective and cognitive domains and this provides a bridge to higher order learning.

The road to success

LOtC institutions are attractive learning sites for children and adults alike. Engaging LOtC institutions in offering teacher training courses in IBSE techniques will be an effective way to motivate teachers to implement IBSE in their classrooms. In addition LOtC institutions house experts working in scientific fields that can offer specialised knowledge to teachers - helping them increase their effectiveness in IBSE. Seventeen partners are involved in this project. They will organise advisory groups in 11 European countries, comprising teachers, teacher trainers, botanic garden educators, representatives of regional or national school boards and science education researchers (optional). All LOtC learning sites are well equipped and experienced in the practical side of developing and conducting IBSE teaching programmes.

All partners will feed into the development of the INQUIRE teacher training course. The education researchers will ensure the theoretical underpinning of the course while other partners will add their expertise and perspectives. In addition the quality and effectiveness of the support mechanism will rely on researchers excellence to support partners and
participating teachers in reflecting on their own doing as well as provide formative assessment while work is in progress. The aim is to develop a training course that is inspiring, meets practitioners as well as school authorities needs and is theory and evidence based. Through collaboration with stakeholders at local levels (Advisory Groups), cultural differences and needs can be incorporated and fed into the overall design of the course which will be finalised at IBSE Expert Consortium level. LOtC institutions will deliver the pilot course in their countries and use their various networks to invite teachers and educators from other LOtC institutions (Natural History Museums, Science Centres, Zoos and other Botanic Gardens) to participate in these courses. The goal is to help these institutions to develop their knowledge and skills in this area in order to deliver INQUIRE courses themselves and snowball IBSE expertise in formal and non formal learning environments throughout Europe. Teachers will be incentivised to participate in the INQUIRE courses through a range of benefits – these will include:

- free professional development
- joining a pan-European network of teachers with an opportunity to communicate with teachers in other European countries
- an opportunity to develop good contact with a prestigious LOtC site.
- an opportunity to showcase good teaching practice and influence practice in their own country and abroad
- an opportunity to participate in the Final Conference
- free entrance to LOtC sites
- free passes for their classes to visit LOtC sites

B.1.2. Quality and effectiveness of the support mechanisms and associated work plan

Figure 1.1. Project progress
The first year of the project will involve developing the pilot course, a teaching manual and an interactive website. Discussions will be held about teaching methodologies, course structure and promotion and how this course can be adapted to different country conditions, taking into consideration cultural differences in educational systems and working practices (WP1 Levelling). The course will be promoted through the various national systems that support continual professional development for teachers. One of the main objectives of the course is also to link informal and non-formal education systems through encouraging educators working in a range of LOtC institutions to participate in the project. The draft course manual will be adapted to the needs of different European countries as well as to the needs of various formal and LOC institutions (WP2). The interactive website (WP6) will encourage dialogue between partners and teachers and showcase best practice methods published on other EU websites, eg. POLLEN, SINUS Transfer, FIBONACCI and S-TEAM. INQUIRE will promote these practices throughout the project in both the formal and LOtC education system in 11 countries. A training workshop will be held for all partners to develop a shared understanding of inquiry-based learning and how it can be used effectively to teach environmental education and sustainable development.

The second year of the project will see the launch of the pilot INQUIRE course in 11 European countries. The course, run by the project partners, will consist of three two-day Modules - one run in each teaching term (autumn, spring and summer) for teachers and LOtC educators from other institutions. The first workshop will focus on training in inquiry-based learning and methods, the second workshop will concentrate on reflective practice methodology and the third workshop will be dedicated to teachers’ developments and reflective practice outcomes. During the workshops, the teaching manual will be discussed and refined and formative evaluation will be used to sharpen the course content. In between workshops, teachers will be encouraged to bring their students to visit the LOtC site and experience IBSE. Educators from other LOtC sites who have attended the INQUIRE course will be encouraged to develop their own network of teachers, teacher trainers and educational researchers to deliver INQUIRE courses the following year. These sites will be responsible for all costs associated with developing their own networks and running INQUIRE courses.

Following the second Module, participating teachers will be encouraged to engage in reflective practice to lookon their own process of change and gather data how IBSE works in their classroom. INQUIRE will support teachers through the website and publish regular electronic newsletters. The challenge of encouraging teachers to participate in the website will be addressed by establishing a teacher recognition scheme to participate in the final European conference. During the year, botanic gardens will also provide an open informal space for teachers to meet and discuss their experiences gained through the project. They will be invited to post new methods and ideas on the website to share with their colleagues involved in the project. INQUIRE will facilitate this sharing through translations.

The third year of the project will see Partners run the course again to consolidate and embed it within the botanic gardens and education systems. At this stage other LOtC institutions are invited to run courses. LOtC institutions are invited to participate in free “Train the Trainer courses” run by partner LOtCs to obtain an insight into the INQUIRE course design. If they are interested in running courses on their own costs themselves, partner organisations will support them by for example, providing already prepared teaching resources. They will not provide funding. The INQUIRE course manual will be finalised, edited and published on-line. It will also be promoted throughout the 11 regional networks. Increasing numbers of teachers are inveited to bring their students to visit LOtC sites and experience IBSE. Partners will support practitioners’ reflective practice through continuing to provide a forum for teachers to meet and discuss practice and INQUIRE will continue to publish regular e-newsletters and encourage shared dialogue through the website. Towards
the end of the project a European practitioners’ (teachers, science educators, researchers) conference will be held to showcase inquiry-based learning in Europe. Through the teacher recognition scheme 14 teachers will be invited to attend the conference.

Quality counts

Formative evaluation focusing on the process of the course development will be carried out during the project life cycle. Additionally an external evaluator will carry out a summative as well as formative evaluation on the meta-level to assess the outcomes of the project. He will not carry our research himself but will rely on data provided by project partners. The external evaluator is brought in at the start of the project and will participate in two consortium meetings (one in the first year and one in the second year). During the third year he will attend the final conference and will hand in two external reports one in month 24 on ad one by the end of the project (month 36).

Project base line:
Inquiry based teaching and learning is strongly recommended by American and European Education authorities as a strategy to develop deeper understanding of science and to apply it to the everyday world. Nevertheless research outcomes are indifferent how effective inquiry based learning is to fulfill these expectation. This indifference is based on the fact that the term “inquiry based learning” is used for a multiplicity of approaches and techniques used to facilitate this process. Different countries, school authorities, LOtC institutions and teachers interpret the term “inquiry based learning” in many different ways. The INQUIRE project will develop and publish a framework how “IBSE” should look like when it is done at LOtC institutions and will set up guidelines how to structure and evaluate IBSE activities offered by LOtC Institutions.

INQUIRE has 11 objectives:
1. To introduce IBSE in formal and informal settings on a large scale
2. To snowball best practice pedagogical approaches through practitioner training
3. To establish a key network of educators, teachers, teacher trainers and researchers for the revival of IBSE
4. To offer front-line support to teachers and informal educators to practice IBSE
5. To use IBSE to engage young people in a scientific discourse about biodiversity conservation and climate change
6. To bridge the gap between educational researchers and practitioners
7. To support the development of European wide standards for evaluating formal and informal education programmes
8. To make the case for inquiry and context based learning
9. To examine the implementation of curriculum based innovations
10. To stimulate and motivate science learning from the earliest stage
11. To increase self-confidence in girls to study science

PLEASE REFER TO ANNEX 2 FOR REFERENCES.
B. 1.2.1. Introducing IBSE in formal and informal settings on a large scale

Michel Rocard Report *A Renewed Pedagogy for the Future of Europe* (2007) defines ‘inquiry’ as:

*the intentional process of diagnosing problems, critiquing experiments, and distinguishing alternatives, planning investigations, researching conjectures, searching for information, constructing models, debating with peers, and forming coherent arguments.*

Science learning environments and activities structured to support learning based on this process are termed ‘Inquiry Based Science Education (IBSE)’. In this proposal we use a definition of science similar to that given in the Rocard report ‘a system of acquiring knowledge based on the scientific method, as well as to the organized body of knowledge gained through such research’ (Rocard, 2007). In the context of this proposal we use the word ‘Science to refer to life sciences.

Discussions continue about how effective IBSE is in developing scientific knowledge and thinking, but these are based on the various understandings of how IBSE should be structured or scaffolded. The report mentioned above concludes

*“Improvements in science education should be brought about through new forms of pedagogy: the introduction of inquiry-based approaches in schools, actions for teachers training to IBSE, and the development of teachers’ networks should be actively promoted and supported.”*

To introduce IBSE in formal and informal settings on a large scale it is essential to develop teacher training courses that focus closely on what constitutes ISBE teaching and learning - what should IBSE look like in order it can live up to the high expectations presented in the report? Best practice teaching needs to be highlighted and reflective practice is carried out to evaluate how ISBE can support students’ understanding of science related subjects. IBSE will help students to develop their epistemological understanding and their social skills as well as their ability to understand the nature of science, and this in turn is envisaged to lead them to develop higher order thinking and problem solving skills. INQUIRE will gather indicative data on a large scale to shed light on which IBSE learning environments are the most effective to achieve given targets.

The members of the project consortium are highly experienced in inquiry-based teaching and learning, in training teachers about IBSE as well as in research related to these issues. For example, the German partner Doris Elster was involved in the implementation and evaluation of a nationwide reform-process in inquiry based education (e.g. the project “Biology in Context”).

The process of inquiry-based teaching and learning can be systematized by an iterative circle containing elements of experimentation and modelling (Mikelski-Seifert & Gromadecki 2007). In this circle scientific knowledge is developed in the interplay of experimentation and modelling. According to Maaß (2007) modelling means solving of complex problems – mostly from the ‘authentic’ real world – by simplifying and structuring them and by making assumptions. Carrying out an experiment means the testing of a scientific hypothesis, developed by drawing on previous knowledge. These hypotheses lead to activities in which variables are defined, modified, controlled, measured and interpreted (Klahr 2000, Hamann 2004). The elements of modelling and experimentation can be seen in inquiry-based teaching and learning, too. Based on this theoretical model and the explanations of the Rocard report the following iterative circle was chosen for the definition of inquiry-based science education in the planned INQUIRE project:
INQUIRE’s main strategy for snowballing IBSE implementation in the selected 11 European countries is through setting up Advisory Groups in each country and offering a number of training seminars through all the participating botanic gardens and natural history museums. “Good quality teachers, with up-to-date knowledge and skills, are the foundation of any system of formal and informal science education” (Osborne and Dillon 2008).

Continuing Professional Development (CPD) for teachers as well as training seminars for teacher trainees is essential if IBSE is to be incorporated into science lessons and, potentially, the overall ethos of schools. Developing and extending the ways in which science is taught is essential for improving student engagement. Transforming teacher practice in the EU is a long-term project and will require significant and sustained investment in continuous professional development (Osborne and Dillon 2008). This project seeks to embed this philosophy and provide long term and stable support and training through a broad and skilled network.

Informal learning institutions are very attractive venues for teacher training. Botanic Gardens and Natural History Museums are recognised as motivational learning places and are often perceived as more exciting than formal learning institutions because of the resources they provide and the settings they offer. The educators working in the institutions involved in this project are all highly educated and have the required experience and knowledge of the content and underlying pedagogy.

The INQUIRE course is envisaged to be organised and promoted in close co-operation with local school authorities. These training sessions will not only support those teachers actively participating in the Course but they are envisaged to facilitate a ‘cascade’ training system drawing in other teachers in participating schools, as well as local, regional and national teacher training centres and networks. A broad dissemination of best practice in science education is envisaged to speed up the adoption and integration of IBSE into classroom teaching and hopefully will provide a large ‘lobby’ group of practitioners who may help influence key curriculum decision makers in each country.
B.1.2.3. Establishing a key network for the renewal of science education

Networks flourish with good communication and personal relationships. Partners in 11 European countries envisage to establish and coordinate an advisory group consisting of teachers, head teachers, regional representatives of national school boards, botanic garden educators and science education researchers (optional). This model worked successfully in the PLASCIGARDEN Project funded by the EU (2005-7) and will be used again in the INQUIRE project. INQUIRE will also invite local authority curriculum planners to join these teams voluntarily. People are envisaged to meet as a group (wherever possible) and/or will be visited by the national coordinator on a regular basis. This group will work collaboratively to support the INQUIRE teacher training course development and encourage the uptake of IBSE through their broad contact base and influential standing. They will examine potential course links to their school curricula and produce a document for submission to the Consortium for levelling with other AG curricula links. The PIC will include training on linking to these individual national curricula.

Teachers and botanic gardens educators will present their classroom-based reflective practice during the workshops and at Advisory Group meetings. This will enable local authority curriculum planners to engage in the process of analysing the inquiry and context based teaching and learning in formal and informal settings, making it more likely that they will support IBSE in the classroom and encourage scientifically literate citizens. Through this process, it is hoped that newly gained knowledge and understanding will be incorporated into improving the national science curricula.

The network will be supported by a Quality Management Team, a Dissemination Management, a web based exchange platform for practitioners and Advisory Groups coordinated by botanic gardens or natural history museums in each participating country. Teachers in all participating countries will be linked through the INQUIRE web based platform to exchange their experiences, knowledge and ideas generated while participating in the INQUIRE pilot courses and carrying out their own reflective practice. They will additionally have the opportunity to meet personally in the final conference.

Botanic gardens educators will cascade this approach through the education networks of key informal science education providers - Botanic Gardens, Science Centres, Zoos and Natural History Museums throughout Europe. These sites will be responsible for all costs associated with developing their own networks and running INQUIRE courses.

B.1.2.4. Offering front-line support to teachers and informal educators to practice IBSE

Inquiry based teaching and learning techniques are often said not to apply in every day school life, because teachers - especially at primary level - do not have the equipment and the background knowledge to use these techniques in class. INQUIRE’s informal education institutions will offer front-line support to organisations - in terms of equipment, background knowledge and advice – to help them feel more confident about undertaking science activities and trying out IBSE. Teaching ideas and resources as well as best practice models and research findings will eventually be available for everybody on the INQUIRE website in 10 European languages. An often mentioned argument against using inquiry and context based learning regularly in class is that these methods are more time consuming than traditional ones.

Teaching materials produced by PLASCIGARDEN, BGCI, SINUS Transfer, POLLEN; S-TEAM, FIBONACCI are available to teachers and offer a ready made set of activities with simple-to-use instructions, all of which are designed to encourage easy uptake in the classroom and promote IBSE. INQUIRE partners will select already published teaching material based on criteria such as: whether the topic is fitting to biodiversity and climate
change, independent evaluation reports indicating take up/effectiveness/teacher approval etc. or papers published in a peer reviewed journal showing some of these recommendations from teacher professional associations. A List of criteria will be drafted, discussed and established in course of the project (Deliverable 1.2). Based on their original language selected materials will be translated into INQUIRE project languages by INQUIRE partner institutions (eg. some of these materials are already available in various languages other materials only in one or two languages). So finally these and newly created teaching materials will be available in 10 European languages (English, German, French, Dutch, Italian, Spanish, Portuguese, Bulgarian, Russian, Norwegian).

The institutions responsible for translations are:

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<td>Belgium</td>
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<td>7</td>
<td>Schulbiologisches Zentrum Hannover (SBZH)</td>
<td>Germany</td>
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<td>8</td>
<td>Jardin Botanique de la Ville de Bordeaux (BORD)</td>
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<td>9</td>
<td>Coimbra Botanic Garden (FCTUC)</td>
<td>Portugal</td>
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<td>10</td>
<td>Moscow State University Botanical Garden (MSU)</td>
<td>Russia</td>
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<td>11</td>
<td>Natural History Museum, Botanical Garden (NHM)</td>
<td>Norway</td>
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<tr>
<td>12</td>
<td>Botanischer Garten, Rhododendron-Park, botanika Bremen (BGRHB)</td>
<td>Germany</td>
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<tr>
<td>13</td>
<td>Universidad de Alcala (UAH)</td>
<td>Spain</td>
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<tr>
<td>14</td>
<td>University of Lisbon (UL)</td>
<td>Portugal</td>
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**B.1.2.5 Using IBSE to engage young people in a scientific discourse about biodiversity conservation and climate change**

Biodiversity, the variety of life on earth, provides us with food, clothing, shelter, medicines, fuel, even the air we breathe. Healthy ecosystems are essential for supporting natural processes and services such as air quality, climate, water purification, pollination, and the prevention of erosion. Yet, despite our reliance on biodiversity, plants and animals are increasingly under threat. For example, it has been estimated that between 60,000 – 100,000 plant species are threatened worldwide. The principle reason for biodiversity loss is human behaviour which is driving threats such as habitat destruction, climate change and alien species introduction.

On 27th August 2002, the European Union ratified the Convention on Biological Diversity. Article 13 of the Convention states that Contracting Parties shall:

a) Promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and

b) Cooperate, as appropriate with other States and international organisations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity

The International Council for Science Education (ICSU, 2002) identified the need to generate capacity to apply science and technology as important for achieving sustainable development. IBSE has an important role to play in this as it emphasises curiosity and observations followed by problem solving and experimentation. Through the use of critical
thinking and reflection, IBSE enables students to make meaning out of gathered evidence. The subject content of the INQUIRE training course will focus on biodiversity conservation and climate change as a means of engaging young people in this critical discourse and equipping them for personal and collective decision making.

**B.1.2.6. Bridging the gap between educational researchers and practitioners**

Teachers and botanic garden educators participating in INQUIRE teacher training courses will be encouraged to engage in reflective practice. By undertaking their own classroom based practitioners research, practitioners can more easily reflect on the reality and effectiveness of learning outcomes. Andrew Morris and Philip Barker (2003) stated that there has been considerable discussion concerning the impact of education research on policy and practice. This has included the importance of an interactive model of education research which is linked to both practice and development, the need to develop research capacity amongst all contributors and beneficiaries of education research, and the importance of two-way communication strategies that link research to practice and vice versa.

The use of practitioner research is increasingly advocated as a self-reflective tool that can promote the development of teachers and science educators. Dillon et al. (2004) reported on an innovative project that demonstrated how teachers and academic researchers could work together on action research projects chosen by the teachers themselves.

Engaging formal and informal practitioners in their own IBSE research helps them to adapt research outcomes more easily. Presenting the practitioners point of view to the education research community and key decision makers in formal education supports discussions on a more practical scale. Researchers, as well as curriculum planners, are able to see which support is most effective for teachers; teachers become accustomed to research terminology, as well as the researchers being able to adopt a language that is understandable by teachers. This helps the communication process all round.

The consortium members have rich experience in using reflective practice methods to promote science teachers voices in school-based reforms (e.g. the UMILE project in Austria Elster et al. 2007), the European projects EUDIST - European development in integrated science teaching; Lang et al. 2007) and CROSSNET –Crossing Boundaries in Science Teacher Networks) To bring together the different successful approaches of action research is a core task within the consortium of the INQUIRE project.

One way to support and encourage practitioners, who begin their own research, is to have a quality management plan that will enable them to analyse data efficiently and produce reasonable results. King’s College London will be responsible for setting up the research standards and will function as a scientific mentor and evaluator, overseeing the practitioners’ reflective practice. Advisory Groups will function as support groups for the discussion, evaluation and adaptation of outcomes.

The final conference, along with other national and international education research meetings and conferences will be used as platforms to present preliminary and final results and will bring researchers and practitioners into close contact. It is envisaged that sustainable relationships will be built through this. The INQUIRE work on IBSE implementation will function as a European role model to bring together, within a constructive and progressive framework, the formal education system, science education practitioners and research staff.

INQUIRE plans to motivate teachers to participate in practitioner’s reflective practice by establishing a teacher recognition scheme which will provide travel and subsistence costs for teachers to attend the final conference. A practitioner’s research challenge will be launched, inviting teachers to hand in their projects. Based on the quality standards published in the INQUIRE Quality Management Plan best practice models will be selected and showcased at the finale conference. 14 teachers (one in most partner countries, two in Spain, Germany
and Portugal) will be selected through the teacher recognition scheme. The Project Management Board will draft the selection criteria and this will be agreed upon and administered by the IBSE Expert Consortium. The selection criteria will be posted on the INQUIRE website with a format for submission. Teachers will be invited to submit their projects via the website. The consortium will evaluate the submissions and select a winner linked to each LotC partner institution (14 in total).

B.1.2.7. Supporting the development of Europe wide standards for evaluating formal and informal education programmes

Informal learning institutes and similar environmental organisations have a huge potential for delivering science education. "Due to the nature of practices, IBSE pedagogy is more likely to encourage relationships between the stakeholders of both formal and Informal education “(EUR 22845, 2007). INQUIRE will encourage practitioners working in the informal and formal sectors to evaluate their teaching practice and programme delivery and share results. Key to the sustainable provision of high quality plant science education delivery, is the sharing and integration of education practice and methodology across the ‘established’ and the ‘emerging’ providers.

B.1.2.8. Making the case for inquiry and context based learning

In the view of the INQUIRE group, subject content should be introduced to the students in such a way that they can be linked to everyday experiences. To promote interest in students’ education, the tasks should be embedded in student-relevant contexts. Based on the theory of motivation (Deci & Ryan, 1993), the relevance of science could be promoted by a variety of authentic science questions. These should enable students to integrate their own ideas and activities and also should invite them to participate in a problem-solving process. The aspect of social embedding is covered by group learning activities, by the integration of Learning Outside the Classroom environments and by the application of that which was learned outside of school (e.g. by being able to participate in discussions and decision making processes).

INQUIRE recognizes that inquiry-based teaching and learning is complex and that specialist aspects such as argumentation skills or disciplinary differences need to be taken into account.

Therefore, INQUIRE will require learning environments in which the following learning can be applied:

- learning is problem-based and involves questioning and hypothesis generation
- learning is based on modeling and experimentation
- there is cooperation between learners working in groups
- there is cumulative learning resulting from curriculum and standards
- there is space to learn from mistakes.
- diversity, including gender, disability, ethnicity and socio-economic background is recognized
- there are self-regulated learning sequences where student autonomy is emphasized
- the central consideration in the design of activities is student interest and motivation.

B.1.2.9. Examining the implementation of curriculum based innovations

Researchers of several projects have consistently cited a common problem, that teachers often mal-adapt ‘well thought out teaching designs’ to old ways of doing things. More knowledge needs to be gained in how to design educational inventions that are appealing to teachers and easy to implement (Squire et al. 2003). Initial results have shown that some
teachers working with pilot classes in the PLASCIGARDEN project (see Evaluation Report on www.plantscafe.net/info) stick to the detailed teaching sequence provided whereas others adapt given materials to their own needs, which had the consequence of changing the underpinning IBSE concept. Classroom based research carried out during the INQUIRE teacher training courses will add further knowledge to what teachers need to transform their own teaching practice. A formative and summative assessment conducted by researchers from the University of Bremen, Germany, will focus on what teachers need to actually change old habits and how this progress should be structured to be most efficient.

As a support action, the INQUIRE scientific and technical objectives should not in themselves constitute research. However, this does not exclude the use of scientific methods and concepts. In science education research, INQUIRE will draw on research in investigative science, argumentation, attitudes to science, interest and motivation, use of external partners and facilities (e.g. botanic gardens, science centres). In teacher education research, INQUIRE will draw on research in teacher collaboration, pedagogical content knowledge, teacher beliefs about science, teacher beliefs about integration out-of-school facilities, video-based reflection on classroom practice.

**B.1.2.10. Stimulating and motivating science learning from the earliest stage**

Recent evaluations carried out in the PLASCIGARDEN project demonstrates that the combination of inquiry and context based teaching techniques used in school and at the botanic garden help primary school children, even at a very early age, to develop scientific understanding. This form of teaching significantly changed their attitude towards science learning.

Science education using IBSE makes learning exciting and stimulates the intrinsic motivation in students to want to learn more about the subject. INQUIRE teacher training courses will utilise already existing IBSE teaching resources and encourage a greater number of children and teachers to learn science in a more motivating way.

Experience shows that learning that includes activities based outside of the classroom is highly motivating, particularly for children between 3 and 13, as it stimulates their intrinsic interest in finding out more about the world they live in. For example the UK Government’s new education manifesto ‘Learning Outside the Classroom’ was launched to emphasise this key issue. (Dillon 2007 and Dillon 2006). Children naturally like to explore their environment, and do this from the moment they are born. INQUIRE teacher training courses helps teachers understand how they can include LOTC learning efficiently into their Inquiry based science teaching. INQUIRE envisages to broaden inquiry based learning approach for children to practice it in the outdoor classroom in 11 European countries. Working at and with a Botanic Garden, Science Centre or Natural History Museum provides new and exciting dimensions for learning. They are stimulating, fascinating, resource rich and offer completely different learning environments from classrooms.

Assumptions in science - that children learn to inquire by simply being involved in doing inquiries and that they learn to marshal arguments by discussing scientific issues - are being challenged (Simon *et al.*, 2006). Thinking skills are at the core of scientific inquiry and argumentation. Any practical work, and particularly out-of-doors work, is necessary to successful plant science inquiry which also demands that teachers understand how to engage children, how to utilise particular skills, how to teach out-of-doors and understand the means by which they can explore children’s learning.

The issue of students’ engagement with science has been a topic of enduring interest in the science education community for the past three decades. Major reviews have been conducted by Ormerod and Duckworth (1975) Gardner (1975), Schibeci (1984) and Osborne et al. (2003). Very little work has been conducted on what views young students hold about science – particularly not from a qualitative perspective that understands
learning as tied to processes of identity construction (Holmes, 2000). INQUIRE offers, therefore, new perspectives on an enduring issue for the field. A considerable body of evidence now exists that, compared to other school subjects, science is failing to engage young people (Jenkins & Nelson, 2005; Lyons 2006; Osborne & Collins, 2001; Sjøbeg & Schreiner 2005). Yet, student interest in science at age 10 has been shown to be high and with little gender difference (Murphy & Beggs 2005). However, in the UK, research has shown that the point of decline begins in the final year of elementary school (Murphy & Beggs, 2005). Indeed, Ormerod and Duckworth (1975) devote a whole chapter of their review on attitudes to science to the considerable body of work which shows that interest in science is a product of student experiences by age 11, drawing on work conducted as early as 1874. A recent and particularly significant contribution to confirming this finding has been Tai et al.’s (2006) longitudinal analysis of NAEP data between 1988 and 2000. Further recent evidence that children’s life-world experiences prior to 14 are the major determinant of any decision to pursue the study of science comes from a survey by the Royal Society (2006) of 1141 science, engineering and technology (SET) practitioners’ reasons for pursuing scientific careers. It found that just over a quarter of respondents (28%) first started thinking about a career in science, technology, engineering and mathematics (STEM) before the age of 11 and a further third (35%) between the ages of 12-14. Likewise, a small-scale longitudinal study that followed 70 Swedish students from Grade 7 (age 12) to grade 11 (age 16) (Lindahl, 2007) found that their career aspirations and interest in science were largely formed by age 13. Lindahl concluded that engaging older children in science would become progressively harder. Such data demonstrates the importance of the formation of career aspirations of young people long before the point at which many make the choice about which subject to pursue at high school and then college. Thus, rather than plugging the leaks in the STEM science pipeline (Jacobs & Simpkins, 2006), we would contend that effort would be much more productively expended by: (a) understanding what are the formative influences on student career aspirations between the ages of 9 and 14; and (b) attempting to foster and maximize the interest of this cohort of young people, particularly girls, in STEM-related careers.

B.1.2.11. Increasing self-confidence in girls to study science

Specific attention should be given to raising the participation of girls in key school science subjects and to increase their self-confidence (EUR22845, 2007). The middle grades are a crucial time for girls in making decisions about how or if they want to follow science careers. Girls develop meaningful strategies to merge their social worlds with the worlds of school science (A. Calabrese Barton and E. Tan 2008). INQUIRE’s training course subject content Biodiversity and Climate Change offers a wide range of topics connected with nature as well as conservation, topics that girls are often particularly interested in (A. Hartinger 2005). Addressing topics such as plant conservation as well as plant diversity in food and art will help girls, in particular, link science to their daily lives.

B.1.2.12. S/T Methodology and associated work plan

B 1.2.12.1. Overall strategy and general description

The INQUIRE Teacher Professional Development Concept

Teachers’ development of competences starts with their pre-service teacher training and should continue through their whole working life. This lifelong learning enables them to act as an expert in the profession of teaching in a world where scientific knowledge is permanently changing. According to Shulman (1986) teachers’ knowledge is distinguished between subject knowledge, pedagogical content knowledge (knowing how to teach the content) and
pedagogical knowledge (knowing how to teach more generally). Further factors, that influence teachers' professional acting are teachers' beliefs related to the subject and its teaching (Bishop, Seah, & Chin, 2003), motivation, interest and self-efficacy (Krauss et al., 2004) and teachers' competences for self-regulation, which enables them to reflect about their own work (Tirosh and Graeber, 2003). Additional factors that influence the teaching practice are their colleagues and their intention to cooperate with each other, their support by school authorities and their interaction with parents (Tirosh and Graeber, 2003).

**Networking in Communities of Learners**

Having this in mind our concept of professional development will be built on repeated cycles of planning, implementation and reflection. Teachers will work in groups together with science educators and researchers and so build up networks. This concept is based on experiences in the projects SINUS, Biology in Context (Bayrhuber et al., 2006, Elster 2007, Elster 2009) and the European projects EUDIST and CROSSNET where teachers built networks to implement educational reforms.

As a theoretical frame for these networks for teacher professional development INQUIRE uses the concept of communities of learners. It stems from theories of situated learning which describe the collaboration of teachers with each other and with researchers (Lave & Wenger, 1991; Borko, 2004). The common goals are to improve learning and teaching skills, to share responsibility for the professional growth and development of colleagues and to partake in professionally guided discourse about one’s teaching and learning. The discourse and the different views of teachers and researchers serve to enhance the process of reflection about their classroom experiences and to expand their horizons, understandings and capabilities.

Gauging the successfulness of a community is no easy task. However, based on the assumptions associated with cognitive apprenticeship and the 'social constructivist perspective implied by communities of learners', Jonassen (1995) identifies seven qualities of meaningful learning which support the successfulness of a community: active, constructive, collaborative, intentional, conversational, contextual and reflective.

Learning communities are groups of individuals who share the same set of concerns, problems and interests in a particular topic. They come together to fulfil both individual and group goals. They focus on sharing experiences, appraising good practices and creating new forms of knowledge. They are dynamic social structures, which require cultivation for emergence and growth. Some design the framework for this cultivation, while others are responsible for the organisational frame. Together, these persons help foster the formalisation of the community and plan activities for the growth and sustainability of the community. Ultimately, however, it is the members of the community who will define and sustain it over time (Wenger, McDermott, & Snyder, 2002; Zellermeyer & Munthe, 2007).

**The INQUIRE Concept of professional development in Learning Communities**

Teachers, science educators and researchers work together in learning communities to transform the theoretically based model of inquiry-based teaching and learning into actual teaching and learning tasks and units. This transformation should take place in a process mutually constructed by teachers and researchers.

*Co-construction is the discursive process between partners, who share their individual knowledge regarding a concrete task and develop together new knowledge or solutions for task or problem solving. (Little, 1990, 15)*
Co-construction requires agreement about the working process and shared goals of researchers and teachers, as well as a critical re-thinking of one’s own practice which can lead to a change in the routine of action.

Furthermore, it is assumed that the professional development of teachers is dependent on teachers’ culture of reflection about their own work (Altrichter, Posch, & Somekh 1993; Elliott, 1991). Action research is expected to support teachers to establish a research relationship to their own practice. It should increase their professional knowledge, enhance the effectiveness of teaching and learning and broaden their autonomous scope. It should empower teachers as ‘reflective practitioners’ (Schön, 1983) to develop ‘tacit knowledge’ (knowledge in action) by ‘reflection on action’.

*Teaching is a highly skilled activity which above all requires classroom teachers to exercise judgment in deciding how to act. Reflective teaching is seen as process through which the capacity to make such professional judgments can be developed and managed. (Schön, 1987, 7)*

In detail INQUIRE training modules will integrate following elements:

| Preconditions – viewing the context | Following a constructivist approach we will start by taking into account preconditions, existing knowledge, values and beliefs of the teachers. We will analyze their school context. We will take into account typical problems teachers have with inquiry-based teaching and learning (e.g. inquiry-based method are perceived as inefficient, problematic to assess …) |
| Analysis | We will offer teachers multifaceted opportunities to investigate and analyze inquiry-based methods in an environment of trust and collaboration. Teachers will work through tasks their students will have to solve. We will use video-based approaches and action research to confront teachers with practices that may contrast to their own. |
| Implementation | We will challenge teachers to experiment and test inquiry-based approaches in their own classrooms. We will support school based networks to plan lessons, to observe each other in action. |
| Reflection | We will support teachers to analyze and reflect their classroom experiences by giving them a variety of methodological underpinnings. Teachers will be encouraged to reflect on their new practices and beliefs. |

It is assumed that the steps ‘Analysis’, ‘Implementation’ and ‘Reflection’ will be repeated many times and with different pedagogical and content aspects within the duration of the INQUIRE learning communities. Our professional development can be regarded as an iterative process in which teachers develop their teaching practice towards inquiry-based education step by step.

*Learning at botanic gardens (Literature see ANNEX 3)*

Botanic gardens are superb locations for inquiry based science education. They contain amazingly diverse collections of plants and plant artefacts and hold extensive botanical, ethnobotanical and horticultural knowledge and skill. Mostly situated in urban areas, botanic gardens are accessible to large numbers of people and as more people now live in cities, botanic gardens are fast becoming some of the few places that can offer stimulating venues for children to gain first hand contextual experiences in IBSE. Osborne and Dillon 2008 recommend putting the emphasis in science education prior to 14 years on engaging students with science and science phenomena. INQUIRE teacher training courses will focus on a wide
variety of investigative work and ‘hands on experiments’ with living organisms, utilising a nature based setting to motivate children between 8-13 years which is, as the two authors put it, the best period in which to achieve the engagement mentioned above.

**Reflective classroom practice**

Teachers and students on courses of initial teacher education (teacher training) are increasingly being expected to demonstrate ‘evidence based practice’ (Taber, 2007). However, one of the primary challenges facing teacher training course designers today is how to design curricula that are appealing and useful to teachers while at the same time bring about transformative practices (Squire et al 2003). INQUIRE will investigate both aspects.

**Assessing INQUIRE course development:**

For the assessment of INQUIRE course development we will use a comprehensive evaluation concept (Lücken & Elster, 2008) which is based on the theory of ‘planned behaviour’ (Ajzen & Madden, 1986). According to this model, the behavior of teachers practicing an inquiry-based approach can be predicted more precisely when specific aspects are considered:

1. Teachers’ attitude toward implementing the inquiry-based approach.
2. the assessment of the perceived attitudes of important other individuals, such as colleagues and school principals (subjective norm),
3. as well as the teachers’ self-efficacy concerning the implementation of the new bik-concept (see Figure 1.3.).

These three aspects predict *teacher behaviour* which is primarily mediated by influencing the *intention* of the teacher to implement the *bik*-concept (Lücken & Elster, 2008).

![Figure 1.3. Evaluation concept based on the Theory of Planned Behavior](image)

To investigate the process of professional development within the INQUIRE courses and networks we will use formative as well as summative evaluation tools. Teachers and science and researchers will be asked to participate in interviews and questionnaires at the initial part of the INQUIRE networking project, again after one year of working in learning communities and at the end of the project. Additionally, ‘best practice – examples’ coming from the different learning communities will be analyzed. According to Wenger et al. (2002), learning communities undergo a life circle, they emerge, grow and possess a life span. If a community is successful over time, the energy, commitment and visibility of the community will develop.
until it becomes institutionalized as a value-added capability. Six phases in the life cycle of a community can be distinguished. During the initial inquiry phase, the purpose, goals and vision of the community are identified. In the design phase, the group defines activities, group processes and roles. In the pilot phase, the group seeks to attain commitment, tests assumptions and refines the strategy. Succeeding this is the launch phase which is characterized by the expansion of the community to a broader audience. In the growth phase, members engage in collaborative activities of learning, shared knowledge and networking. In the core of the sustain phase, activities centre on cultivating and assessing the knowledge and the products created by the community, as well as on developing strategies, goals, activities and technologies for the future. The six phases model can serve as an evaluation guide for the development of the INQUIRE learning community.

Assessing pupils development when implementing ISBE teaching methods in class

INQUIRE training courses will engage teachers and botanic garden and natural history museum educators to examine how curriculum innovations can be implemented across multiple classrooms throughout Europe. INQUIRE will encourage teachers to investigate questions such as:

- Does it pay off to spend more time on IBSE compared with traditional learning methods?
- To what extent does IBSE support pupils constructivist learning, epistemological and the development of social skills etc?
- How influential is the role of the teacher in IBSE learning process?
- Does IBSE meet the needs of teachers with different abilities?

Classroom based research not only helps practitioners to reflect on their own practice but helps them to modify their own teaching sustainably (McLaughlin et al. 2006). Supported by King’s College, London, teachers and informal science educators in 11 European countries will engage in reflective practice to learn how resources can be adapted to suit individual teacher needs and whether this adaptation will influence how pupils develop their critical thinking skills and scientific practices through the use of inquiry and context based learning resources.

Sharing experience

Teachers are key players in the renewal of science education. Being part of a network allows them to improve the quality of their teaching and supports their motivation (EUR22845, 2007). INQUIRE will link teachers in 11 European countries via an interactive web-based platform and this will be open to all researchers and practitioners participating in this project to exchange experience, knowledge and ideas generated while participating in INQUIRE courses. There is enormous potential for many lessons to be learnt and shared. INQUIRE findings and outcomes will be disseminated and open for discussion with the international research community during a final international conference, as well as at other international meetings. This practical knowledge will be used to develop the INQUIRE course curriculum further and adjust it to practitioners needs in the 11 European countries.

Linking INQUIRE resources to other IBSE based initiatives, learning outside the classroom and working with living organisms

The INQUIRE teacher training course content will link with other IBSE EU project initiatives such as the PLASCIGARDEN (PLANTSCAPE), SINUS TRANSFER, POLLEN, FIBONACCI etc. All initiatives offer biological themed IBSE activities that can be used in
teaching ‘Biodiversity and Climate Change’ (e.g. POLLEN cycle 2: A seed a plant? and
SINUS Transfer materials addressing biodiversity). These materials together with newly
designed materials will add a creative dynamic perspective to learning about and being in
direct contact with living organisms that are closely connected to children’s daily lives.
Creating inspirational, educational experiences 'out of the classroom' that will engage
children in investigative work, is at the heart of the proposed INQUIRE project.
PLANTCAFE collection of 44 modules help to place aspects discussed theoretically in
SINUS TRANSFER science modules into practice. Linked to the theoretical background
provided in SINUS TRANSFER, practitioners are envisaged to use INQUIRE teaching
modules in 10 European languages to trial the IBSE approach (e.g. M7 Promoting Boys
and Girls, M8 Promoting Students cooperation, M2 Working in a scientific manner etc).
The detailed teaching sequences, background knowledge and practical support from
professional botanic garden and natural history educators offered through the INQUIRE
project, are envisaged to help practitioners overcome barriers. They may also help
practitioners understand the theoretical background of the Sinus Transfer Modules.
INQUIRE will also resonate in a broader field, supporting developments to mitigate the
projected European (and global) wide crisis of a lack of ecologists and conservation experts
and supporting the educational directives within the UN adopted ‘Convention on Biological
Diversity’ and the ‘Global Strategy for Plant conservation’, to which the EU is a key signatory
and player.

How the course is structured

This one year training course will address primary and secondary school teachers as well as
LOtC Educators. It oversees a manageable work load that could be easily integrated within a
full time teaching schedule. The course will be held during holidays/ over weekends/or during
working hours depending on participating countries customs.

In between three Modules (each 2-3 days =20h; 60h for the whole course) teachers and
educators will gain experience while working with ready-to-go teaching materials to develop
their own IBSE material with their own classes.

Teachers will integrate visits to Botanic Gardens and Natural History Museum into their
teaching.

Teachers will work with inquiry and context base teaching techniques in schools and at
botanic gardens and natural history museums and will experience how exciting and
fascinating science learning can be.

Teachers will learn how to evaluate their pupils learning outcomes and will learn how to do
scientifically guided reflective practice - which will consider whether or not pupils change their
attitudes towards science learning, develop scientific understanding through observing,
thinking, experimenting and validating, gain more confidence in designing their own
experiments and develop their cognitive, conceptual, social and epistemological skills.

Course content “Biodiversity and Climate Change” will address the needs of 9-14 years old
learners and will invite primary and secondary school teachers to participate.

Estimated participants:
The course will run at participating partners institutions twice. One course during the second
year and one during the third year.

In the first year of running the INQUIRE pilot course, 14 Partners in 11 European countries
envision to train approximately 210 primary and lower secondary teachers and ca 70
informal educators. The same amount of teachers and educators are envisaged to attend the
course in the third year (again approximately 210 teachers and 70 educators).
This number is likely to increase substantially as other informal institutions in each of the partner countries run their own courses on their own costs. In the first two years of running the INQUIRE training course, the 14 Partners will directly reach more than 10,000 children (420 teachers each teaching 25 children).

How the Modules will look:

The three modules will build on each other and offer a step by step development for participating teachers.

Learning goals are listed in the following figure:
B.1.2.12.2. Timing of work packages and their components

The central goal of the project is to develop an INQUIRE course design, addressing primary and secondary school teachers needs, that is flexible enough to work in different European education systems. Pilot INQUIRE course will run in each of the 11 participating countries. While one course will run in most of the participating countries, two will run in Portugal, Spain, and Germany (all in all 14 Pilot Courses) in the second project year. Alongside the pilot course, a formative and summative evaluation is conducted and supported by partners KCL and UniHB which will help to improve the course design while work is in progress. It is planned to develop this final course version into a standard available course offered by participating botanic gardens in cooperation with their local teacher training institutions within times to come. The project is structured within nine work packages with four in consecutive phases. Each phase is characterized by one work package. Four work packages span the whole project duration. An external evaluation is planned.

<table>
<thead>
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<th>Work package (WP)</th>
<th>WP- Number</th>
<th>WP-Leader</th>
<th>Duration</th>
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<tr>
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<td>WP 1</td>
<td>BGCI</td>
<td>Month 1-4</td>
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<td>Levelling</td>
<td>WP 2</td>
<td>LFU</td>
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<td>INQUIRE course development</td>
<td>WP 3</td>
<td>UniHB</td>
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<td>Implementation</td>
<td>WP 4</td>
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<td>WP 5</td>
<td>KEW</td>
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<td>WP 9</td>
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</tr>
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</table>

The project structure is kept as simple as possible. A number of partners will be allocated the same workload to make supervising and monitoring the project progress accomplishable. This will also make it easier for the Management Board to identify delays in the sense that partners will operate more or less independently and so delays will be limited to a particular partner.

The inaugural meeting (month 2) and the first Consortium Meeting will be crucial to establishing detailed timescales and management structures. In the inaugural meeting participants will agree on a detailed project schedule and deadlines for submitting work discuss draft versions of “Project Planning, Dissemination Plan, and the Quality Management Plan” Partners will discuss and agree on the procedures that need to be taken should a partner not meet the required standards and deadlines. The modalities of money transfer will be discussed and agreed upon, keeping various risks in mind. Each partner will provide a Letters of Intent from a regional Teacher Training Institutions demonstrating their commitment to support the implementation of the INQUIRE teacher training course in their country. (See work package description).

**Consortium Meetings:** Consortium Meetings will enable work to be supervised and deadlines checked regularly. In total there will be 5 Consortium Meetings in three Years (a 6th is optional) and each meeting will last 2 days (2 nights including arrival and departure). Partners will be invited to host one of the 5 meetings. Two people will represent LFU and BGCI while all other partners will be represented by one person. In case partners send more than one person to meetings they will explain why.
The partner responsible for **Quality Management** will support the project at the Consortium level. This partner will ensure the smooth progression of the project and support partners to achieve high quality standards agreed upon.

**Management Board Meetings** will generally be held one day before Consortiums Meetings except the first one which is held in month 1 to prepare the Inaugural meeting. This meeting will be held between partners BGCI, KCL, LFU and UniHB. It is planned as a video conference. Therefore Work package Leaders will not attend this meeting. All other Management Board Meetings will include all management board members. The Management Board will be dedicated to preparing Consortium Meetings and to support Botanic Gardens achieving the INQUIRE objectives. A final meeting at the end of the project is optional.

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<tr>
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<td>Task 6.11. Launch and update Website (Devforum)</td>
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<td>Task 7.3. Support partners</td>
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<td>Task 9.5. Permission of parents</td>
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<td>Task 9.6. Permission of school authorities</td>
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### WT1 List of work packages

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<td>WP1</td>
<td>Month 2</td>
<td>Meeting schedule and minutes</td>
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<td>WP4, WP6, WP7</td>
<td>Month 5</td>
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<td>WP4</td>
<td>Month 12</td>
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<td>WP 4, WP 6 WP 7</td>
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<td>WP5, WP 6, WP7, WP8man</td>
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<td>Course manual live on website</td>
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</tbody>
</table>
Work package 1 (WP1): Project Set Up

Work package 1 will be initiated with a Management Board meeting that will prepare for the Inaugural Meeting (Kick Off Meeting) in Brussels. This will be attended by at a minimum 5 people (LFU, BGCI, KCL, UniHB and the External Evaluator) and is planned to be organized as a video conference. This Management Board will prepare detailed timescales and management structures to facilitate the progress of the project. “Project Planning”, “Dissemination Plan”, “Quality Management Manual” will be drafted and sent to partners before the inaugural meeting.

The Inaugural Meeting will gather the whole consortium for the first time. This will involve 19 people – 2 people each from LFU and BGCI and 1 person from each of the other partners. In case partners send more than one person they will explain why.

The consortium will work and agree on a detailed project schedule guided by the Management Board and agree deadlines and quality standards for handing in work carried out during the project.

A list of criteria for selecting existing IBSE teaching material to be used in the pilot INQUIRE course will be discussed, agreed on and finalized by the end of month 4.

Consortium members will discuss the draft of the “Dissemination Plan” and will add local and international activities run on their behalf. Project Management Board will finalize this work by the end of month 4.

The Quality Management team will discuss ideas with the consortium partners relating to the Quality Management Plan (see WP 7). Participants’ ideas and individual, local and regional circumstances will be considered and a final version of the Quality Management Plan will be added to the Consortium Agreement.

Each Partner will identify and invite relevant members to participate in their Advisory Group. Each partner will document their members for inclusion on the INQUIRE website. A document detailing their Advisory Group constitutions will be produced.

Measurable outcomes at the end of WP1

<table>
<thead>
<tr>
<th>Measurable outcomes at the end of WP1</th>
<th>Month</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Final version of <strong>Project Planning</strong> is sent to project partners</td>
<td>4</td>
<td>D.1.1.</td>
</tr>
<tr>
<td>2. <strong>Document explaining Criteria</strong> on how to select IBSE teaching</td>
<td>2</td>
<td>D.1.2.</td>
</tr>
<tr>
<td>material is sent to partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. <strong>Document detailing Advisory Group constitutions</strong></td>
<td>4</td>
<td>D.1.3.</td>
</tr>
</tbody>
</table>

Work package 2 (WP2): Levelling

Partners will constitute and manage their Advisory Groups (AG). Each partner will decide whether they reimburse travelling costs for their members of the AG.

The installation of **Advisory Groups** supporting INQUIRE activities voluntarily has proven to be successful in the PLASCIGARDEN project already and will be documented in 11 EU-partner countries. Via experts knowledge gathered in group discussions partner institutions will **plan for opportunities to localize official training activities to the national curriculum** as well as legal and structural conditions in each participating country. Partners will collect information, e.g. curriculum requirements, criteria and requirements for INQUIRE course implementation and discuss these with their AG. AG’s will decide which existing teaching resources (PLANTS CAFE; SINUS TRANSFER; POLLEN; S-TEAM; FIBONACCI, BGCI, local material etc) are relevant and will fit within the INQUIRE training programme based on the criteria identified in WP1.
Partners will call on their ‘national knowledge’ to discuss national needs for developing the pilot INQUIRE course. National differences will be discussed and strategies developed to meet the needs of each country when it comes to offering the courses via the local teacher training systems.

The First Consortium Meeting in month 5 will focus mainly on developing a shared understanding of inquiry based science education for developing the pilot INQUIRE course (PIC), including teaching techniques and methods. The discussions will be underpinned by a theoretical basis.

Action minutes of the first consortium meeting will summarize the shared understanding established (Document summarising how IBSE is defined in INQUIRE course).

In addition a “Strategy plan” will be formulated for implementing the course within each local teacher training system and will be sent to the Management Board by each participating partner. The Management Board will examine each strategy plan and produce a final INQUIRE Course Implementation Plan (CIP) that takes into account national differences by the end of month 5. The INQUIRE Course Implementation Plan will summarize potential links to school curricula and national requirements across 11 countries and will be published.

<table>
<thead>
<tr>
<th>Measurable outcomes at the end of WP2</th>
<th>Month</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Partners submit a list of Advisory Group members by the end of month 5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2. Partners submit their local Course Implementation Plan</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3. “INQUIRE Course Implementation Plan (CIP) produced and published (Recommendation from Advisory Groups)</td>
<td>5</td>
<td>2.1</td>
</tr>
<tr>
<td>4. Document summarising how IBSE is defined in INQUIRE course</td>
<td>5</td>
<td>2.2</td>
</tr>
</tbody>
</table>

**Work package 3 (WP3): INQUIRE Course Development  Month 4-12**

By participating in the Advisory Group (AG) all stakeholders (formal and informal educators, teachers, school authorities, etc) are invited to bring their knowledge and skills when it comes to developing the ‘pilot INQUIRE course’ (PIC) at a regional level. They will work on a voluntary basis and will meet twice a year. In between they will be informed about project progress via the INQUIRE newsletter.

The INQUIRE teacher training course will bring together teachers from the school sector (formal education) with educators form site-based education centres (informal education). Teachers participating in the courses should develop an understanding of how to facilitate inquiry based science education in their classrooms as well as outside at botanic gardens and natural history museums. These experiences are envisaged to deepen and enrich children’s understanding of science.

Participation in the INQUIRE teacher training course is envisaged to support teachers to make the most of using IBSE materials with their students. IBSE often requires technical resources and living organisms. Teachers will be encouraged to use their school gardens as well as site based education centres that usually offer far more in terms of natural resources as well as specialist equipment. By bringing the formal and informal sectors together, teachers are envisaged to benefit from the amazing resources that site-based education centres have to offer. Pupils will also have the opportunity to see real conservation in action and this will facilitate their understanding of the need to address biodiversity conservation and climate change. We envisage that a visit to a botanic garden or natural history museum will no longer be just a nice day out but an integrated part of pupils and teachers science curriculum in 11 European countries.

Because inquire based teaching methods often require a considerable amount of technical resources and living organisms we hope that teachers learn to use LoTc learning environments to enrich their...
INQUIRE

pupils science learning environment by integrating LOtC attractions and expert knowledge to go for Inquiry based learning. The main goals the INQUIRE course will aim for are:

- to support teacher with scientific knowledge to teach Biodiversity and Climate change in IBSE classes as well as at LOtC learning site
- to encourage teachers to develop a proficiency in facilitating IBSE learning (how to work with experiments, facilitate group discussions, support students to develop higher order thinking skills)
- to support students and teachers to understand basic concepts of selected Climate Change and Biodiversity issues
- to encourage teachers own development while reflecting on their own teaching and evaluating ISBE learning outcomes

Informal educators will provide profound background knowledge as well as methodological experience when it comes to structure and scaffold IBSE learning process in class as well as at LOtC institutions. Learning in a formal as well as an informal learning environment will support not only pupils but also teachers to give IBSE a go. These informal learning sites provide a unique setting and learning resources that a formal school environment simply cannot provide. Teachers will be introduced to teaching concepts that rely on the school as well as on the informal learning environment and will learn to extract the best from both.

Ideas and materials will be gathered at the national level and partners will document and bring them to the consortium meetings (month 5 and 10). The aim is to ensure that cultural differences and needs can be incorporated within the overall course design or can be met through individual adaptations right from the beginning.

The first year of the project will involve developing the pilot INQUIRE course modules and publish a draft Pilot INQUIRE Course (PIC) manual.

Discussions will be held about teaching methodologies, course structure and promotion and how this course can be adapted to different country conditions taking into consideration cultural differences in educational systems and working practices. A Strategy plan for PIC promotion in each country and on an international level will be discussed and agreed upon.

Relevant existing teaching material will be identified according to the criteria published in Month 4 and adapted where necessary to the subject content (Climate Change and Biodiversity) and translated into INQUIRE project languages.

The PIC manual will be adapted to various needs in various European countries and for various formal and LOtC institutions. The goal is to finally develop an overall European INQUIRE course design that is flexible enough to work in different European education systems.

During the second consortium meeting partners (month 10) partners will learn how they can contribute to the formative and summative assessment carried out alongside PIC implementation (facilitated by Uni Bremen), how reflective practice can be carried out by PIC participants (facilitated by KCL) and how LOtC institutions can support PIC participants development.

The Management Board will present the draft selection criteria for the teacher recognition scheme and the consortium members will discuss and finalise the criteria.

A ‘Train the Trainer’ Course (TTC) manual will be developed to support partner organisations preparing to run the PIC in their institutions.

TTC’s will be held in each partner institution to ensure high quality standards when it comes to facilitating the pilot INQUIRE course.

<table>
<thead>
<tr>
<th>Measurable outcomes at the end of WP3</th>
<th>Month</th>
<th>Deliverable</th>
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<tbody>
<tr>
<td>1. PIC manual is distributed to all partners (including a framework for action research to be carried out by pilot INQUIRE course participants)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>2. Strategy plan for PIC promotion is sent to BGCI by each partner</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
Work package 4 (WP4): Implementation

The PIC will be carried out by each participating LOtC in every participating country from Month 10 – Month 24. In total 14 courses (one course in most of the partner countries, two in Spain, Germany and Portugal) are envisaged to be carried out. This one year training course will oversee a manageable workload that could be easily integrated within a full time teaching schedule. The course will be held during holidays/over weekends/during working hours depending on participating countries customs. It is structured in three modules (each 2-3 days =20h; 60h for the whole course). In between these modules teachers will be encouraged to work in class and try out what they have learned during course modules.

It is envisaged that at least 15 primary and low secondary teachers (all in all approximately 210 primary and lower secondary teachers) and at least 5 informal educators (all in all ca 70 informal educators) will participate in each course.

Formative and summative assessment, focussing on professional development of participating teachers will be carried out for selected courses (at least 11 courses in 11 different countries). Outcomes that lead to changes will be incorporated into the course design.

The final INQUIRE Course (IC) design will be established based on formative assessment results.

From month 24 – month 36 educators from other botanic gardens, natural history museums or science centres will be invited by LOtCs to participate in the free TTC’s to develop their own knowledge and skills to run future INQUIRE courses at their own institutions (open ‘Train the Trainer’ courses). These sites will be responsible for all costs associated with running INQUIRE courses. The third consortium meeting will be held in month 15.

The final version will be offered to teachers as INQUIRE course in year three.

From Month 24 – Month 36 indicatively 14 INQUIRE courses will be organised.

It is envisaged that at about 15 primary/secondary teachers (all in all approximately 210 teachers) and about 5 informal educators (all in all ca 70 informal educators) will participate in each course.

It is envisaged that the INQUIRE course will develop into a standard available course offered by participating botanic gardens in cooperation with their local teacher training institutions within times to come.

<table>
<thead>
<tr>
<th>Measurable outcomes at the end of WP4</th>
<th>Month</th>
<th>Deliverable</th>
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</thead>
<tbody>
<tr>
<td>1. Manual for the pilot IC design is sent to partners (Pilot INQUIRE course manual)</td>
<td>13</td>
<td>4.1.</td>
</tr>
<tr>
<td>2. List of Train the Trainer courses run by each participating organisation is send to BGCI</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>3. A list of all TTC courses delivered by project partners is produced</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>4. List of PIC course participants and their feedback is sent to BGCI</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>5. A Documents showing pilot PIC participants feedback is produced</td>
<td>25</td>
<td>4.2.</td>
</tr>
<tr>
<td>6. List of IC course participants and their feedback is sent to BGCI</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>
7. A. documents showing IC participants feedback is produced
8. List of teachers participating at the final conference is sent to BGCI
9. A summary table of all teachers participating in the final conference is produced by...
10. 14 teachers will be selected through the teachers recognition scheme to attend the final conference

Work package 5 (WP5): Sum up Month 32-36

The final outcomes of the project are summarised. Teachers will get support in preparing posters for the Final Conference. The Quality Management report will be completed. All project outcomes are summarised and material will be collected for final project reports.

The INQUIRE course manual will be revised and will be published on the website in 10 European languages

An optional final consortium meeting is planned to the close of the project and will provide opportunities to discuss and plan further cooperation’s between partners.

<table>
<thead>
<tr>
<th>Measurable outcomes at the end of WP5</th>
<th>Month</th>
<th>Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manual for INQUIRE Course is published on the website in 10 European languages</td>
<td>36</td>
<td>D.5.1.</td>
</tr>
</tbody>
</table>

Work package 6 (WP6) Dissemination Month 1-36

The INQUIRE course will be promoted through the various national systems that support continual professional development for teachers. One of the main objectives of the course is to link informal and non formal education systems, by encouraging educators working in LOIC institutions to participate in the project. INQUIRE will focus attention on supporting IBSE in 11 European countries, bridging the gap between researcher, practitioners and key decision makers as well as setting up a European wide network of IBSE practitioners to support and encourage each other to put adequate teaching and learning techniques into practice.

Successful dissemination of the outcomes is of particular importance. A Dissemination Officer working at BGCI will be dedicated to fulfilling these requirements. A dissemination strategy will be prepared by the end of month 4 including all potential opportunities for disseminating INQUIRE ideas and findings.

The INQUIRE website will be set up during the course of the project and will be translated into 10 European languages. It will be updated on a regular basis and enable practitioners to interact with each other and to exchange knowledge and experiences gained while participating in the INQUIRE pilot courses. The Dissemination Officer will maintain the English area of the website and partners will update their own language areas in collaboration with the Dissemination Officer. The website will contain a range of materials including downloadable resources, links to relevant websites, training videos, images and news items. The final course manual will also be uploaded onto the website in month 36.
E-newsletters will also be sent out regularly to inform subscribers (botanic garden educators, teachers and school authorities) about new developments happening in the project and announce any materials that may be of relevance. E-newsletters will be written by the Dissemination Officer with input from partners, then be translated by partners and distributed throughout the 11 countries.

Information leaflets promoting the INQUIRE pilot courses will be prepared and translated and sent out by the end of month 10 to recruit teachers onto the courses. Scientific papers, abstracts, posters and oral presentations will be submitted at national and international meetings and conferences. Both the scientific community and the public media will be kept informed on a regular basis about developments with the INQUIRE project via press releases.

The Final Conference: We envisage that the target audiences for the final conference will be teachers, informal educators and members of the science education research community. It is indicative that INQUIRE teachers and informal educators will present their reflective practice data collected during the pilot INQUIRE courses and their knowledge gained through the formative and summative evaluation of the course. In addition, teachers, informal science educators and researchers working in other EU IBSE projects will be invited to share preliminary and final results. All in all 100-150 delegates are expected to participate.

Community building on the international level will be supported through presenting papers and posters at international conferences throughout the whole project duration such as BGCI’s International Congress on Education in Botanic Gardens (Mexico 2012), American Public Gardens Association Annual Conference (Philadelphia, 2011), ECSITE conference Warsaw, Poland May 2011, European Association of Zoos and Aquaria (Innsbruck, 2011), European Science Education Research Association (ESERA, Lyon, France, 2011), etc. The INQUIRE website will also be promoted to networks of LoTc institutions worldwide (e.g. botanic gardens (BGCI, BGEN), zoos (WAZA, EAZA), wetland centres (WLI), Field Study Centres (FSC), RSPB sites, natural history museums, science centres (ECSITE), environmental education networks (e.g. Australian Association of Environmental Education (AAEE), Environmental Education Association of Southern Africa (EEASA)).

Project partners will make their training sessions available to potential associate partners (or ‘friends of INQUIRE’) who may send a representative (at their own cost) to training sessions (open and free Train the Trainer courses). This will support LoTc community building on a national and international basis.

Support project management when it comes to prepare deliverables and documents for publication.

<table>
<thead>
<tr>
<th>Measurable outcomes at the end of WP6</th>
<th>Month</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Website launched</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2. 9 E-newsletters disseminated (one every four months)</td>
<td>4, 8, 12, 16, 20, 24, 28, 32, 36</td>
<td>6.1.</td>
</tr>
<tr>
<td>3. Dissemination Plan (including an open section for additional dissemination work that will emerge during the course of the project)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4. Dissemination Summary</td>
<td>36</td>
<td>6.3.</td>
</tr>
<tr>
<td>5. 1,500 leaflets distributed to teachers</td>
<td>13</td>
<td>6.2.</td>
</tr>
<tr>
<td>6. Four presentations/posters at 4 international conferences</td>
<td>10, 12, 21, 24</td>
<td></td>
</tr>
<tr>
<td>7. Action minutes of consortium meetings</td>
<td>2, 4, 10, 15, 24, 36</td>
<td></td>
</tr>
<tr>
<td>8. Final Conference program is published on website</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>9. Proceedings of the Final Conference</td>
<td>36</td>
<td>6.4</td>
</tr>
</tbody>
</table>
This work package is dedicated to creating a supportive structure for practitioners’ development. The Quality Management Team (KCL and UniHB) = QMT will work in tandem with all partners to ensure that every team will produce high quality outputs with respect to running and evaluating pilot course progression.

UNI Bremen is responsible for supervising summative and formative assessment of the Pilot INQUIRE course development as well as Pilot INQUIRE participants professional development (month 10-24). KCL will oversee reflective practice done by participating teachers and educators. LOTC Partners inform teachers and educators about how work is shared between these two partner institutions.

Participating teachers are supported to reflect on their own classroom teaching and learning and all activities developed and used are supposed to meet the defined and agreed standards. For teachers reflective practice, INQUIRE will draw on research in investigative science, argumentation, attitudes to science, interest and motivation, use of external partners and facilities (e.g. botanic gardens, science centres).

For summative and formative course evaluation, INQUIRE will draw on research in teacher collaboration, pedagogical content knowledge, teacher beliefs about science, teacher beliefs about integration of out-of-school facilities, video-based reflection on classroom practice.

The QMT, after discussing and designing the Quality Management Plan within the first four months, will be responsible for overseeing the INQUIRE course activities carried out in all 11 participating countries. The QMT will support practitioners to analyse, summarize and present outcomes. Outcomes will be evaluated to meet the expected high standards. The Quality Management Plan will be adapted to emerging needs in month 18. Best practice models, recommendations and ideas will be included in a detailed Quality Management Report by the end of month 36. The report will be uploaded to the INQUIRE web site in month 36. The QMT will develop a draft document that will be discussed during the Inaugural Meeting.

### Measurable outcomes at the end of WP7

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Month</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Draft version (discussion points) of quality management plan is provided</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2. Quality Management Plan</td>
<td>12</td>
<td>D.7.1</td>
</tr>
<tr>
<td>3 Final Quality Management Report</td>
<td>36</td>
<td>D 7.3.</td>
</tr>
</tbody>
</table>

### Work package 8 (WP8) Project Management

INQUIRE’s Management Board is responsible for ensuring smooth project progress. It will support the project at the consortium level. A meeting schedule will be set up and updated according to participants’ needs. A management handbook (website domain to share documents, minutes, agreements etc) will be installed 5 Management board meetings will be held to plan and prepare consortium meetings. It is planned to hold the first meeting as video conference. Project periodical reports will be prepared in months18 and 36.

### Measurable outcomes at the end of WP8

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Month</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Management handbook (= Website domain) is installed</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2. Required reports are produced</td>
<td>18, 36</td>
<td></td>
</tr>
<tr>
<td>3. Recommendations from consortium meeting</td>
<td>12, 24, 36</td>
<td>D.8.1.</td>
</tr>
</tbody>
</table>
Work package 9: Ethical issues

Based on the EU recommendations addressed in the Ethical Review Report (date 16.09.2010) the INQUIRE consortium will establish an additionally work package “Ethical Issues” including two dimensions:

1) Ethical issues in relation to plants

2) Ethical issues regarding children protection, safety and data protection

The responsibility of the work package “Ethical issues” is at the partner University Bremen. An independent ethics observer follows the progress of the work and proofs comply with ethical issues.

- At the 1st consortium meeting the ethics observer will present the dimensions of ethical issues which has to receive consideration in the INQUIRE project. Additionally, the observer will present a draft version of guidelines regarding the ethical issues and discuss this draft version with the consortium.

This version is based on British educational guidelines (BERA):
which notes that "……any form of publication, including on the internet; does not directly or indirectly lead to a breach of agreed confidentiality and anonymity". Thus, Special Clause 15 should be used and the participants will confirm in the Consortium Agreement their adherence to the national legislation.

As a product of the 1st consortium meeting the observer will develop the final version of the ethics guideline and will distribute it to the consortium members and additionally to the European Commission.

- At each further consortium meeting the observer follows the progress of the work and prepares comments regarding the ethical issues during the meetings. These comments will be presented and discussed at the phase of final reflection of each meeting.

1) Ethical issues in relation to plants

Climate change, rainforest clearance, biodiversity and conserving natural habits are challenging issues. However, a green future is only possible if today’s children are sensitized and educated to protect nature and to support our transition from high to low carbon and sustainable economies. Schools, universities and other education institutions like botanic gardens play a critical role in shaping the world’s future. They are responsible for an education for sustainability for a greener tomorrow and for preparing children and young learners to be tomorrow’s decision makers and to be active and responsible citizens.

Therefore, in the initial part of the INQUIRE project (at the 1st consortium meeting), a guideline “Ethical issues in relation to plants” will be developed. The guideline is an evaluation instrument for the assessment of INQUIRE materials and teaching units. The guideline addresses socio-scientific issues like genetically modified plants and foods (e.g. Golden Rice in India), ethical issues in relation to plants like the use of drugs and medicines from plants (e.g. cannabis and it’s consequences), environmental issues (e.g. invasive plants) in the context of research with and in developing countries, sustainable development and biodiversity.

The guideline is basis for the development and evaluation of the INQUIRE materials. Each developed material will line out in which it addresses ethical issues in relation to plants. The INQUIRE pilot course will comprise a training session about the including of ethical aspects in relation of plants.
1) Ethical issues regarding children protection, safety and data protection

Children become part of the project INQUIRE in the framework of different school projects. Therefore, the INQUIRE consortium takes care that the participating children have the opportunity to achieve their full potential. Based on the Every Child Matters agenda (2003) the participating children should be enabled to be as physically and mentally healthy as possible, gain the maximum benefit from the presented INQUIRE educational opportunities, life and act in a safe environment and be protected from harm, experience emotional well-being in a network of reliable and affectionate relationships and develop good inter-personal skills and confidence in social situations.

To secure these children rights the INQUIRE consortium will develop an information manual about ethical issues based on the British educational guidelines (BERA see above).

This manual will have two sections:

A. Safety and risks management of children visiting the botanic gardens and

B. Data protection

The information manual will be sent to the European Commission prior to the start of work with schools (2nd year).

A. Safety and risks management of children visiting the botanic gardens:

As the institutional guidelines of visiting botanic gardens and other science centers in the participating European countries differ from each other the INQUIRE consortium will develop a information guideline about the management of the following possible risks:

- Children may suffer from hay fever in varying degrees or asthma. They can become ill from a large pollen intake. Therefore, measures like a “First-help-suitcase” will be reachable to have emergency medication and procedures reachable. Additionally, the managers of the plant gardens and the local meteorological service shall be conducted to get information about the local bio-weather and the pollen contamination.

- Children can be lost in the large gardens. Therefore, each child will have a map of the garden and will be trained how to read this map. If children have inquiry-based tasks that require their leaving of the school group they will act in small groups with other class-mates (not as a single). Additionally, a telephone helpline for the children who may got lost, a special place where all lost can go, are part of the “No child can got lost”-program.

- A risk assessment will be undertaken by the local INQUIRE project partner for every local activity which involves children / young people being taken from their school, visiting the botanic garden or science center, conducting lab work or any other activity in the INQUIRE project. The risk assessment will be held on file and will be available for local inspection (school head, school authority).

- The risk assessment includes transportation (e.g. The use of coaches with seat belts. The transportation needs to be booked well in advance. Telephone helpline for the children)

The ethic manual will be discussed within the INQUIRE consortium and with all agents involved in the research, especially teachers and trainers in botanic gardens. Based on the ethic manual a model of an information sheet for children and their family will be developed.
B. Ethical issues regarding data protection

The second section of the information manual about ethical issues will describe the way of data selection, storage and protection. Therefore, the INQUIRE consortium will ensure compliance with the existing national regulation on data protection and privacy for each participating country.

**Children protection and safety**

Regarding the permissions for and exploitation of outputs and findings with children involved in the project for further dissemination the INQUIRE consortium has the following policy:

**Permission of parents**

The participation within the INQUIRE project needs the obtaining consent of the parents and the assent from the child. Without the permission of the parents no child or young person will take part in the INQUIRE project. The INQUIRE project partners may take photographs or video footages of children and young people during the activities they undertake, however, before the images are produce for use (e.g. reports, website, teaching materials), they will obtain consent from parents / families / guardians. After obtaining consent for the images of children / young people the INQUIRE project partners may produce the images according the following guidelines:

- We will not use photographs or video footage which clearly identifies the child or young person, school, college or institutions. We achieve it by blocking out school ties, badges, crests or other identifying features.
- We avoid using the real name of the child or young person.
- If a child or young person has to be named, we avoid using photograph or video footage.
- Images are securely stored and used only by those authorized to do so, particularly if images of children will be on the internet.

Timeline: The parents’ permission is required at the project start and before each visit of the botanic garden or science center. Parents and children has to be informed about the local situation in the garden (e.g potential risks and pollen contamination).

**Permission of the school authority**

Each participating institution needs a permission of the local school authority for the conducting of research with teachers and children. The school authority confirms the support of schools, teachers and students who participate in the INQUIRE project especially in the field of data collection and data protection. Additionally, the school authority gives support for dissemination the INQUIRE program in schools, school networks and in-service teacher training.

Timeline: The permission of the school authority is required at the project start (beginning of the first project year).

**Permission of the school head / principles**

Each participating teacher needs a permission of the school head (principle) for doing research with children. The school head confirms his/her support of the participating teacher, allows the excursions to the botanic garden and is responsible for the communication and dissemination of the INQUIRE project in his / her school (e.g information of the school conference)
Timeline: The permission of the school head is required at the piloting of INQUIRE program (beginning of the second project year).

<table>
<thead>
<tr>
<th>Measurable outcomes at the end of WP9</th>
<th>Month</th>
<th>Deliverable</th>
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<tr>
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WP Leader: BGCI

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Objectives:
- Inaugural meeting
- Install Advisory Groups
- Quality Management Frame

Description of work:
This work package is dedicated to setting up the project. All partners will meet for the first time to discuss and agree on project structures and characteristics.

Task 1.1 Inaugural meeting: This meeting will take place at the National Botanic Garden of Belgium. The project consortium will meet for the first time, providing and opportunity for partners to get to know each other. Based on draft versions of the documents prepared by the Management Board, the consortium will work on a detailed project-structure, establish deadlines, define a research framework, meeting schedule etc. A training session will be organised to train partners in uploading information to the INQUIRE website. This meeting will last two days (two nights) and will be essential for a smooth and effective project progression.

Task 1.2. A document with “selection criteria” will be developed. INQUIRE will rely partly on teaching material already published by other European “IBSE-Projects”. The consortium will discuss and develop a document listing criteria for those materials suitable for the pilot INQUIRE course. A document explaining the list of criteria will be published on the project website (Month 4).

Task 1.3. Advisory Groups (AG) are established in each participating country. Project ideas are presented at the first meeting. Partners will invite various local and regional stakeholders in education (teachers, school boards etc) to form an Advisory Group. These people will work together voluntarily within these groups and provide project partners with local and regional information about eg. the curriculum and regulatory requirements to implement the INQUIRE course within local professional teacher development systems as well as provide knowledge about teachers’ needs and schools requirements (see the detailed description about Advisory Groups). AG’s will meet on a regular basis (once or twice a year) to discuss issues and inform each other about project progression.
Task 1.4. KCL and UniHB will discuss the draft version of a “Quality Assurance Manual” with partners during the Inaugural meeting. The version will be developed further based on these talks. Partners will provide ideas and individual local and regional circumstances to be considered.

**Deliverables:**
- Deliverable 1.1.: Project Planning (month 4)
- Deliverable 1.2.: Document explaining criteria on how to select IBSE teaching material (month 4)
- Deliverable 1.3.: Document explaining Advisory Group constitutions (s. Task 1.4.)

**Milestone 1:** Inaugural Meeting (Month 2)
Work package 2:

WP Leader: LFU

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Objectives:
- Have a shared understanding of Inquiry Based Science Education promoted in this project
- All partners acquire the essential knowledge to accomplish the INQUIRE pilot course successfully

Description of work:
This Work package is dedicated to developing a shared understanding of what attributes are characteristic of inquiry based science education for INQUIRE courses. Partners will all participate in this process to develop a shared understanding.

Task 2.1. Partners collect national information
Supported via their Advisory Groups, partners will collect information e.g. curriculum requirements, local criteria and requirements for INQUIRE course implementation etc. They will introduce this information into consortium discussions and will therefore support the INQUIRE course development that will lead to a course adapted to the educational systems in various EU countries. Information collected will be summarised and published in the INQUIRE Course Implementation Plan (CID).

This document summarises potential links to school curricula across 11 countries as well as legal and structural requirements that need to be considered in all participating countries see task 2.5.

Task 2.2. Partners will manage the Advisory Groups established in WP1. Partners will invite AG representatives on a regular basis (at least twice a year) to share their knowledge and experience within all discussions and developmental work required for designing the pilot INQUIRE course manual that meets national and regional circumstances (e.g. curriculum, teachers needs etc). A list of all AG members is sent to the Management Board by partners (month 5).

Task 2.3. Meetings with National Botanic Gardens, Natural History Museums and Science Centre are organized to inform other “Learning outside the Classroom” institutions about the INQUIRE project. In addition partners will aim for inspiring LOtCs to take part in snowballing the INQUIRE course idea and run future courses themselves.
### Task 2.4. First consortium meeting (month 5)

This meeting will focus mainly on developing a shared understanding of inquiry based science education for developing the pilot INQUIRE course manual. Action minutes of the first consortium meeting will summarize shared understanding (Document summarising how IBSE in INQUIRE course is defined)

### Task 2.5. Strategy plan for course implementation (national and international)

Integrating the course in the each particular countries teacher training offers will require a course design that is flexible to be adapted to various national needs. Partners will develop a national strategy plan for integrating the INQUIRE course into their regional teacher development programmes. In addition being part of a European project will support project activities on a national level. A strategy plan will be discussed during the course of the consortium meetings to develop ideas and strategies on how to support partners efforts on an international level (final INQUIRE course Implementation Plan (CID).

### Deliverables:

- **Deliverable 2.1.:** INQUIRE Course Implementation Plan (CIP) (month 5)  
  (Recommendation from Advisory Groups)
- **Deliverable 2.2.:** Document summarising how IBSE is defined in INQUIRE course
Work package 3:

WP Leader: UniHB

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**Objectives**:
- Pilot INQUIRE course design is developed

**Description of work**:

This work package is dedicated to developing the pilot INQUIRE course design. Existing IBSE resources will have already been examined and suitable ones will be adapted to subject content needs. Representatives of all partner countries will participate in this process so that individual countries needs can be addressed right from the start. Trainers will be selected and trained in all participating countries. Official Teacher Training Institutions will inform Advisory Groups about their particular requirements. Work in progress is evaluated (Formative assessment).

Work comprises:

Task 3.1. Second Project Consortium Meeting (month 10): This meeting will focus on bringing the pilot INQUIRE course development work to an end. Partners will learn how they can support the formative and summative assessment carried out alongside the PIC implementation, how reflective practice can be carried out by PIC participants and how LOIC Institutions can support PIC participants to become reflective practitioners.

Task 3.2. Develop the pilot INQUIRE course modules: Month 4-12 will focus on developing the pilot INQUIRE course modules. A detailed structure about goals, tasks and expected outcomes will be discussed.

Task 3.3 Adapt selected teaching material

Based on the List of Criteria develop in WP 1 already existing IBSE teaching material will be selected and adapted to subject contents needs (SINUS transfer, POLLEN, PLANTSCAFE, S-Team, FIBONACCI, BGCI)

Task 3.4. Pilot INQUIRE course manual (PIC manual): this manual will include teaching sequences, the theoretical background etc. and will be designed to support participating partner organisations to run the pilot INQUIRE course successfully. – is

Task 3.5. Train the trainer seminars are held in participating countries:

Based on the Pilot INQUIRE course manual, botanic garden educators will be trained in partner institutions to run the PIC successfully. Materials needed to teach the courses will be prepared and if necessary translated into each partners’ national language. Educators
will learn how to support course participants’ reflective practice as well as the formative and summative pilot course evaluation. This will ensure high quality standards when it comes to facilitating the pilot INQUIRE courses in participating countries.

Task 3.6. A Train the Trainer Course manual (TTC) will be developed to support partner organisations to run the PIC in their institution.

Task 3.7. Strategy plan for course promotion. Advisory Groups will develop a strategy plan how to promote the pilot INQUIRE course in their country. These plans will be collected and put into Deliverable 3.1.

Task 3.8. Selection criteria for the teacher recognition scheme is developed by the Management Board and agreed on by the Consortium.

Task 3.9. One meeting of Advisory Groups.

Task 3.10. Publish a document with descriptions and links to selected materials for inclusion in the PIC.

**Deliverables:**
Deliverable 3.1.: Strategy Plan for Pilot INQUIRE Course promotion (month 8)
Deliverable 3.2.: Document identifying relevant educational materials for inclusion in PIC (month 8)

**Milestone 2:** Website is launched (month 5)
Work package 4:

WP Leader: MTSN

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Objectives:
- INQUIRE pilot Course is planned to be implemented in 11 European Countries (14 Gardens)
- Formative Assessment of Course Progress leads to developing the final design
- Practitioners reflective practice in 11 European Countries supports progressive development of teachers

Description of work:
The work package will focus on the pilot INQUIRE course which will be held in year 2. LOTC partners in all participating countries will run these courses, evaluate them and support educators and teachers to become reflective practitioners while participating in these courses. LOTC educators will provide a space for teachers to meet at their sites to discuss and share work. Teachers will also receive regular E-newsletters and relevant articles about reflective practice will be published on the website. In year 3, partners will run courses again and will support other “Learning Out Outside the Classroom” Institutions to offer INQUIRE teacher training themselves.

Work comprises:
Task 4.1. Third Project Consortium Meeting (month 15): Partners discuss experiences gained while running the first of the three pilot INQUIRE course modules and planning the INQUIRE final conference.
Task 4.2. Run pilot INQUIRE courses (month 10-24 Formative assessment will support the development of the course design while work is in progress. 14 initial pilot courses will be organised. This is envisaged to involve approximately 280 participants (20 participants/course).
Task 4.3. A summary table of PIC participants in all participating countries is produced. Partners send their participant lists to BGCI. They will collect and produce an international list. This list will show how many teachers and LOTC educators are participating in pilot INQUIRE courses all over Europe.
Task 4.4. Support practitioners (course participants) development. LOTC educators will support course participants to carry out reflective practice as well as practicing inquiry.
based teaching at school and in the botanic garden. LOtC educators will provide a space for teachers to meet at their sites to discuss and share work. Teachers will also receive regular E-newsletters and relevant articles about reflective practice will be published on the website.

Task 4.5. Conduct formative and summative assessment: Based on the assessment framework “Quality Management Plan” educators will support formative and summative assessment activities.

Task 4.6. Develop a final INQUIRE course design based on formative assessment. Adaptations will be made while work is in progress. This final course design will be used in the third year when the INQUIRE course will run for the second time in each participating country.

Task 4.7. Run the second INQUIRE course (IC month 22-month 36) in each participating country (using the final course design)

Task 4.8. IC participant lists are collected and a summary table is produced

Task 4.9. Run free “Train the Trainer” courses for invited LOtC institutions (at least one in each participating country). Invited institutions will be asked to help snowball the INQUIRE course throughout Europe.

Task 4.10. Publish train the trainer course (TTC) manual

Task 4.11. Publish selection criteria for teacher recognition scheme on the INQUIRE website

Task 4.12. Fourth consortium and management board meeting (month 24)

**Deliverables:**
- Deliverable 4.1.: Pilot INQUIRE course manual (month 13-36)
- Deliverable 4.2.: Train the trainer course (TTC) manual (month 14)
- Deliverable 4.3.: Selection criteria for teacher recognition scheme is posted on the INQUIRE website (month 17)
- Deliverable 4.4.: Pilot INQUIRE course participants feedback (month 25)
- Deliverable 4.5.: INQUIRE course participants feedback third year (month 36)

**Milestone 3.** Pilot INQUIRE course runs in 11 countries (month 12)

**Milestone 4:** End of Pilot INQUIRE course (month 24)
Work Package 5:

WP Leader: KEW

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Objectives:
- Round up work
- Look forward

Description of work:
This work package is dedicated to rounding up work that needs to be finished by the end of the project and finalize steps to be taken to achieve sustained success in implementing the INQUIRE teacher training course in professional development systems within participating countries.

Work comprises:
Task 5.1. Present Quality Management Report (international and national level): The quality management report will be published on the INQUIRE website and the via the EU public relation system.

Task 5.2. Finalize steps to implement INQUIRE courses on a local level. The course is planned to be offered sustainably to teachers via local teacher training institutions and hopefully will be offered all over the country in cooperation with L0tC Institutions following the end of the project.

Task 5.3. Optional Final Project Consortium Meeting: This meeting will be the last meeting. Time will be used to discuss future cooperation and strategies to support INQUIRE course implementation and set up an inquiry based teaching network in L0tC Institutions throughout Europe. Partners will present a summary of national activities carried out during the course of the project to showcase the effort each partner has put into the INQUIRE project. Whether the meeting will take place will be decided by the consortium based on the current state of affairs.

Task 5.4. Work on publications: Publications will be prepared while work is in progress. Partners will support teachers to publish their work (national and international journals, newspapers, books, school or education board publications, school websites etc).

Task 5.5. Develop future dissemination and activity plan. This plan will show what dissemination activities are planned following the completion of the INQUIRE project in participating countries. A focus will be put on “Train the Trainer courses” to spread the...
INQUIRE course throughout European “Informal Learning” institutions.
Task 5.6. The final INQUIRE Course Manual is produced and published on the INQUIRE website as well as on the EU central information provider.

**Deliverables:**
Deliverable 5.1.: Final INQUIRE Course Manual (month 36)
# Workpackage 6

WP Leader: BGCI

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## Description of work:

Dissemination activities will focus on sharing information and knowledge between partners and with society.

**Task 6.1. E-Newsletter (every 4 month).** BGCI will produce an electronic newsletter every four months. Each newsletter will contain news about the INQUIRE project, information about relevant resources and a feature about one of the partners. Partners will be asked to contribute news and information to the newsletter which will be produced in English. Partners will then be responsible for translating the newsletter into their own language and distributing it electronically through their INQUIRE networks.

**Task 6.2. Inform other Learning outside the Classroom (LoTc) institutions in participating countries inviting educators to participate in INQUIRE training courses.** An INQUIRE information leaflet will be produced and translated into 10 languages. Partners will distribute this leaflet to other LoTc institutions in their own countries and invite them to participate in an INQUIRE training course. BGCI will promote the INQUIRE course to networks of LOICC institutions worldwide including botanic gardens, zoos, wetland centres, Field Study Centres, RSPB sites, natural history museums, science centres and environmental education networks.

**Task 6.3. Present preliminary and final results at national and international meetings and Conferences.** Partners will endeavour to participate in national and international meetings and conferences to promote the INQUIRE project. Partners will propose meetings (at least one per year) at the national level and BGCI will propose meetings at the international level. For example, European Science Education Research Association (ESERA, Lyon, France, 2011), European Association of Zoos and Aquaria (Innsbruck, 2011), American Public Gardens Association Annual Conference (Philadelphia, 2011), ECSITE conference Warsaw, Poland May 2011, BGCI’s International Congress on Education in Botanic Gardens (Mexico 2012).

**Task 6.4. Author Dissemination Reports (first, second and final).** BGCI will keep a record of all dissemination routes and report back on the successful uptake of the project.

**Task 6.5. Organise Final Conference.** BGCI will organise the Final Conference in the UK. The conference will be in English and will run over two days. It will take place in month 32. Approximately 150 attendees from the 11 countries are envisaged to attend the conference including educators, teachers, researchers and education decision makers. BGCI will:

- Identify a suitable venue for 150 delegates
Develop the conference programme,
Identify keynote speakers to address the conference
Produce a conference flyer to promote the conference and distribute via the INQUIRE website, e-newsletter and partner networks.
Set up a Final Conference area on the website
Correspond with delegates
Produce the registration booklet
Organise catering
Liase with hotels and delegates to support bookings
Produce the conference programme
Publish the conference proceedings on-line

Task 6.6. Press releases (national basis). BGCI will produce six press releases (two per year) during the project. These will be translated by partners into their languages and distributed through their networks. BGCI will maintain a database of press contacts.

Task 6.7. Press releases (international basis). BGCI will distribute press releases (two per year) at the international level. This will include LOTC networks such as botanic gardens, zoos, museums, science centres, etc., international organisations such as IUCN-The International Union for Conservation and Natural Resources, UNESCO, UNEP, etc.

Task 6.8. Support project consortium members with organizing meetings. Five (an additional one is optional) consortium meetings will be held during the three years. BGCI will organise the logistics for the meetings (arranging agendas, liaising with partners, producing papers, minutes, etc). The host institutions will be responsible for the on-the-ground organisation (venue, refreshments, accommodation suggestions, transport, etc).

Task 6.9. Survey education research. BGCI will carry out a survey of research that has been carried out into IBSE, summarise it and make this information available on the INQUIRE website.

Task 6.10. Supporting practitioners to get in contact with each others on an international basis (Link teachers via website ). BGCI will create a list serve, linked to the INQUIRE website, for practitioners to post questions and contact each other. The international list serve will be in English. Following discussion with partners, BGCI may create different list serves for each language.

Task 6.11. Launch and update Website. The INQUIRE website will be launched in month 5. It will be translated into 10 European languages and updated on a regular basis to enable practitioners to interact with each other and to exchange knowledge and experiences gained while participating in the INQUIRE pilot courses. BGCI will maintain the English area of the website and partners will update their own language areas in collaboration with BGCI. A three hour training session will be run at the first consortium meeting to train partners in uploading information to the website. The website will contain a range of materials including downloadable resources, links to relevant websites, training videos, images and news items. There will also be a members only section for partners. The final course manual will also be uploaded onto the website in month 36.

Task 6.12. Results are put on the EU central information provider for dissemination. BGCI will ensure that the results from the INQUIRE project are uploaded to the EU central information provider.

Task 6.13. Support project management in preparing deliverables and documents for publication

Deliverables:
Deliverable 6.1.: Dissemination Plan (national + international month 4)
Deliverable 6.2.: INQUIRE Information Leaflet in 10 languages (month 13)
Deliverable 6.3.: Dissemination Summary (month 36)
Deliverable 6.4.: Proceedings of the Final Conference (month 36)

Milestone 5: Final Conference
Work package 7:

WP Leader: KCL

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Objectives:
- Achieve a high degree of course quality with all participants, addressing formal requirements in an effective, timely and responsible manner.

Description of work:
Quality Management Team (QMT) will mainly focus on the evaluation processes carried out during the INQUIRE course development as well as during its delivery. Partner KCL (practitioners support) and Uni Bremen (formative and summative assessment of teachers development) will develop a Quality Management Plan to support educators and teachers in all 11 participating countries to come up with reliable and comparable INSPIRE course outcomes.

For teachers reflective practice, INQUIRE will draw on research in investigative science, argumentation, attitudes to science, interest and motivation, use of external partners and facilities (e.g. botanic gardens, science centres).

For summative and formative course evaluation, INQUIRE will draw on research in teacher collaboration, pedagogical content knowledge, teacher beliefs about science, teacher beliefs about integration of out-of-school facilities, video-based reflection on classroom practice.

Work comprises:
Task .7.1. Development, implementation, communication and maintenance of an agreed Quality Management Plan (incl. Practitioners Handbook, Formative and summative Assessment Framework). A draft version (discussion points) will be developed at the beginning of the project and will be discussed during the Inaugural Meeting. Partners will agree on the detailed Quality Management Plan within the first 4 months. This plan will include:

a) Formative and summative assessment will focus on the professional development of participating teachers and will be carried out in selected courses (at least 11 courses in 11 different countries running between month 10-24). Outcomes that lead to changes will be directly incorporated into the course design.

b) The Practitioners manual for INQUIRE course participants will include guidelines on how to structure and run reflective practice while implementing ISBE in classroom situations. This reflective practice will also include IBSE activities carried out at
Task 7.2. Management and implementation of **Quality Management Plan** (e.g. checklists, Feedback analyses and -loops, etc.):

Task 7.3. Support partners: Helpful interaction with all responsible partners and project teams, concerning course activities (KCL will visit each partner at least once.). In addition the QMT will use consortium meetings to support partners in fulfilling their tasks.

Task 7.4. Updates of the QM Plan: The Quality Management Plan needs to be flexible to be adapted to unforeseen circumstance. A good working relationship will be established between the Quality Management Team and LOtC partners to guarantee a smooth project progression (month 18)

Task 7.5. Report on a timely basis on the performance of course activities: Partners will report to the QMT on a regular basis (reporting time will be listed in the Quality Management Plan) informing the team about difficulties, success, outcomes etc.

**Deliverables**:

Deliverable 7.1. Quality Management Plan (Month 12)

Deliverable 7.2. Final Quality Management Report (month 36)
Work package 8:

WP Leader: LFU

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Objectives:
- Ensure optimal use of resources (human and other) available for the project
- Ensure timely execution of all project relevant activities
- Ensure smooth and effective communication and integration between all partners
- Internal assessment of the work done during the course of the project

Description of work:
The INQUIRE Management Board is responsible for the day to day operation of the project to ensure that project milestones are reached within the proposed time and agreed upon deliverables are issued in a timely manner as well as in high quality. The managerial responsibility is assumed by the project coordinator (LFU).

Work comprises:
Task 8.1. First Management Board Meeting focuses on preparing the Inaugural Meeting (is planned as videoconference therefore only partner LFU, BGCI, Uni Bremen, KCL and the External evaluator are planned to participate) as well as developing a detailed project structure. In this meeting the Management Board will draft a “Project Planning document” a “Dissemination Plan”, a “Quality Assurance Manual” Draft versions and discussion points will be sent to partners prior to the Inaugural Meeting so they can prepare for the discussions during the meeting. This will speed up the process.

Task 8.2. Organisation of all consortium meetings
Task 8.3. Web based exchange platform (management handbook)
Task 8.4. Conflict management
Task 8.5. Internal and External Reporting (project and management reports)
Task 8.6. Financial administration
Task 8.7. Project Coordination: is focusing on a timely completion of planed WP deliverables (harmonic relationship between participants contributing to the WP) as well as the financial administration of the project. The coordinator is also responsible for handing in reports to the EU commission on time (reporting period.18 month, reporting date month 18 and 36).

The coordinator is supporting the Project Management Board when organising consortium meetings (agenda, venue, minutes) and internal communication with regard to project results and management reports. Together with WP leaders the coordinator is responsible for quality control of WP outcomes.

Task 8.9. External Evaluation Report. LFU will be responsible for providing all necessary
information needed to support the External Evaluator carrying out his work.

### Deliverables:
- **Deliverable: 8.2.: Recommendations from Consortium Meetings (month 12, 24, 36)**
- **Deliverable: 8.3.: Final External Evaluation Report (month 36)**

### Milestone 6: INQUIRE course manual published on website (month 36)
Work package 9:

WP Leader: UniHB

<table>
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<table>
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| Pers. months | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Objectives:
- Meet ethical concerns addressed in the Ethical Review Report date 16.09.2010

Description of work:

Based on the EU recommendations the INQUIRE consortium will establish an additionally work package “Ethical Issues” including two dimensions:

1. Ethical issues in relation to plants
2. Ethical issues regarding children protection, safety and data protection

Task 9.1. At the 1st consortium meeting the ethics observer will present the dimensions of ethical issues which has to receive consideration in the INQUIRE project. Additionally, the observer will present a draft version of guidelines regarding the ethical issues and discuss this draft version with the consortium. As a product of the 1st consortium meeting the observer will develop the final version of the ethics guideline and will distribute it to the consortium members and additionally to the European Commission.

Task 9.2. At each further consortium meeting the observer follows the progress of the work and prepares comments regarding the ethical issues during the meetings. These comments will be presented and discussed at the phase of final reflection of each meeting.

Task 9.3. Develop a guideline “Ethical issues in relation to plants” The guideline is an evaluation instrument for the assessment of INQUIRE materials and teaching units. The guideline addresses socio-scientific issues like genetically modified plants and foods (e.g. Golden Rice in India), ethical issues in relation to plants like the use of drugs and medicines from plants (e.g. cannabis and its consequences), environmental issues (e.g. invasive plants) in the context of research with and in developing countries, sustainable development and biodiversity.. The guideline is basis for the development and evaluation of the INQUIRE materials. Each developed material will line out in which it addresses ethical issues in relation to plants. The INQUIRE pilot course will comprise a training session about the including of ethical aspects in relation of plants.

Task 9.4. Develop an information manual about ethical issues. This manual is based on the British educational guidelines (BERA – see description of work – Workpackage 9) and will have two sections:

A.) Safety and risks management of children visiting the botanic gardens
B.) Data protection

The information manual about ethical issues will be sent to the European Commission prior to the start of work with schools (2nd year).

Task 9.5. Partners recover permission of parents (project start + before each visit to the LOtC Institution)
Task 9.6. Partners recover permission of School Authority is collected (month 4)
Task 9.7. Partners recover Permission of Schools head /principle (month 12)
Task 9.8. The progress of compliance with the requirements will be described in the periodic/final Reports under the Section 3.2.2 ('Work progress and achievements during the period')

**Deliverables:**
Deliverable 9.1. Information Manual about Ethical Issues (month 12)
WT 6 Project effort by beneficiaries and work package

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<th>WP2</th>
<th>WP3</th>
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Graphical presentation (Pert diagram)
Significant risks and associated contingency plan

Risks and strategies to overcome them:

To fully address risk mitigation, the applicants have identified the following risks in the project.

This is a possibility of a delay in the work progress. This risk is medium. The impact of such occurrence is low as the following strategy has been developed:

Possible deviations from the time plan will be minimized by continuous monitoring of progress, regular planning and analysis of progress per work package, and the analysis of achievement of milestones as well as deliverables.

The coordinator is responsible for identifying any negative deviation of the time plan and for taking corrective measures in that case. The inaugural meeting is crucial for setting up and agreeing detailed time schedules and quality standards.

For the purposes of further risk assessment, each work package leader will be asked to identify and describe the risks that may hinder the progress of work within the individual WP and to present these risks to the project management in the form of a table indicating the probability, impact, a contingency strategy and the person who is responsible for the mitigation strategy for each risk.

In the first consortium meeting the consortium will agree on the modalities of how the funding will be distributed during course of the project. Payments will be according to work handed in on time.

The second possibility of a risk is partners leaving the consortium. The probability of this is medium. The impact of such a potential leave is low as there are several botanic gardens in every country. In the unlikely event of a partner leaving the consortium, we would actively seek a new partner. Even with a new partner on board we are convinced that the overall intent of the project can still be maintained.

A third potential risk is illness of key staff during a critical phase of the project. This will not be a threat in this project as every partner has more than one person involved in the project who is in charge of exercising the project. Furthermore, the partners in this project are not dependent on each others’ performance, which means that a bigger problem in one part does not necessarily affect the other parts.

A fourth potential risk is lack of interest by teachers in the project. This risk is considered low given the high numbers of schools and teachers seeking out training at botanic gardens. Teachers will be incentivised to participate in the INQUIRE courses through a range of benefits – these will include:

- free professional development
- joining a pan-European network of teachers with an opportunity to communicate with teachers in other European countries
- an opportunity to develop good contact with a prestigious LOtC site.
- an opportunity to showcase good teaching practice and influence practice in their own country and abroad
- an opportunity to participate in the Final Conference
- free entrance to LOtC sites
- free passes for their classes to visit LOtC sites

A fifth potential risk is that no teaching material which is already published will either meet INQUIRE selection criteria or will be accessible as an open source for the use in INQUIRE courses. This risk is considered low given the high numbers of resources and the fact that most of them have been developed in course of EU funded projects (and therefore should be handled as “open source material”). In case this will happen we will develop our own teaching materials to be used in the INQUIRE course.
A sixth potential risk is *that teachers will not be motivated to engage in reflective practice* or hand in their work for the “teachers recognition scheme”. This risk is considered low because an essential part of the course will focus on reflecting about old and new teaching practices. Teachers are informed right from the start that engaging in reflective practice is an essential part of the course and one will only get a degree/certificate (depending on national rules) if he or she will meet given demands.
B.2. Implementation

B.2.1. Management structure and procedures

The management structure of the project will be based on three formal groups (Management Board, IBSE Expert Consortium, Advisory Groups). The IBSE Expert Consortium will summarize all representative from each participating country. The IBSE Expert Consortium will meet on a regular basis (5 Consortium Meetings, an Inaugural Meeting and a Final Conference). In each country an Advisory Groups (teachers, school board, LOTC institution, teacher training institutions, LOTC educators) is installed. IBSE Expert Consortium members from the UK and Germany will run this Advisory group jointly.

B 2.1.1. The Management Board

The Management Board comprises six people:
- Quality Management (2)
- Dissemination Management (2)
- Project Coordinator (2)
- Work package leaders (2)
The Management Board (MB) is the operational structure of the project, and is responsible for supporting the INQUIRE project on a daily basis. The MB is responsible for the overall support of the coordination activities, as well as horizontal functions that apply to several areas for which coordination activities are carried out. The central support function is continuously developed over time in accordance with experience gained from the co-operation.

The main tasks and responsibilities of the MB are:

- project decisions in the field of project results, procedures (including selection criteria for the teacher recognition scheme), activities to be carried out and support for partners to fulfil INQUIRE quality standard agreed in the consortium agreement.
- to interact with the INQUIRE Consortium for guidance and advice with respect to the goals and activities of the project, for instance to ensure a basis for the project results on practitioners reflective practice and INQUIRE course content;

The Management Board meets mainly during Consortium Meeting sessions. One additional meeting is planned to prepare the Inaugural Meeting. This meeting is planned to be organized as video conference.

B.2.1.1. Quality Management (QM)

The Quality Management Team is responsible for ensuring that the project meets the INQUIRE objectives and that resources are used effectively. The Quality Managers (KCL, UniHB) will facilitate a clear systematic approach for achieving goals. Partners will be aware of existing research. Practitioners will report on progress to the Quality Managers on a regular basis.

The Quality Managers will support a coherent approach. They will develop a Quality Management Plan (month 4). This manual will consist of:

- A “Practitioners manual” for INQUIRE course participants will include guidelines on how to structure and run reflective practice while implementing ISBE in classroom situations. This reflective practice will also include IBSE activities carried out at participating LOtC institutions.
- A “Summative and Formative Evaluation Framework”, to evaluate the process of professional development of teachers participating in pilot INQUIRE courses. UniHB is responsible for this part of the work. The summative and formative assessment will focus on 11 pilot INQUIRE courses, data will be collected in 11 Partner countries and analysed by UniHB.

QM helps to organize consortium meetings. It is also responsible to evaluate outcomes of these meetings and checking reports from the quality point of view. KCL will visit each participating partner once to discuss local circumstances. The final Quality Management Report (Month 36) will include best practice models by the end of the project and will include formative and summative evaluation results. This Report is published on the INQUIRE website to support practitioners all over the world to initiate reflective practice in IBSE as well as teacher training course developers.

B.2.1.3. Dissemination Management (DM)

The Dissemination Management is hosted by BGCI, a worldwide networking organization with over 20 years experience in coordinating, managing and disseminating projects.

The DM will draft publishable deliverables and will work closely with the Project Coordinator (PC) for final revision before these papers will be sent to the EU Commission and will be released to the public. DM will help to organize consortium meetings and to develop the project handbook (web portal which supports data exchange between project partners). The development and the maintenance of the INQUIRE website will be carried out and the Final Conference will be organized.

The DM will be responsible for all dissemination activities described in WP 6.
B.2.1.4. Project Coordinator (PC)

The project coordination is hosted by LFU. Coordinators responsibilities include communication and schedule management, coordinating meeting materials and assisting project team by:

- monitoring and coordinating the development process
- project plan execution and monitoring
- updating of the project plan
- coordination of the work package leaders
- carrying out the operational management of the project
- maintaining contact with and between partners
- reporting to the IBSE Expert Consortium
- preparing documents and delivering information needed for the decisions of the IBSE Expert Consortium
- maintaining contact between Management Board members
- carrying out correspondence with the EU Commission
- fostering the awareness of gender equality and gender mainstreaming in the project
- monitoring compliance with legal regulations of the European Community concerning gender equality
- monitoring the overall legal, contractual, and ethical management
- coordination of knowledge management and other innovation-related activities
- providing information to all Partners on principles and guidelines for the protection of IPR

Reporting to the EU commission:

The PC is also responsible for reporting to the EU commission. After the partners work has been collected and formatted by the DM, the QM will check it and pass it to the PC who is responsible for finalising all deliverables and reports before they are handed in.

Reporting to the Eu commission will involve:
- being the contact person for the INQUIRE EU project coordinator
- handing in all reports and deliverables on time and in good quality
- clarify administrative, legal or financial questions when the emerge in course of the project

Financial administration:

In addition the financial administration is carried out by the PC and involves:
- Control of personnel resources
- Monitoring of financial resources and expenditures
- Preparation of cost statements and financial reports
- Obtaining audit certificates by each of the participants (if applicable)
- Distribution of payments from the Commission between consortium members

B.2.1.5. Workpackage Leaders (WP Leaders)

WP leaders are members of the Project Management Board. Each work package is the responsibility of a work package leader.

<table>
<thead>
<tr>
<th>Participant No</th>
<th>Participants organization name</th>
<th>Leader for Work package no</th>
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</thead>
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<td>WP2 and WP8</td>
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<td>WP3 and WP9</td>
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<td>WP5</td>
</tr>
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<td>3</td>
<td>KEW, UK</td>
<td>WP7</td>
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</table>
The activities of the work package leader comprise:

- Participate in Project Management Board meetings (except the first Management Board meeting in month 1 as this is planned to be a video conference)
- Collect work done in between working sessions
- Monitoring and coordination of the development process of the work package
- Work package plan execution and monitoring; updating of the plan
- Reporting to the management board, handing out deliverables
- Organize meetings if scheduled and be responsible for the minute taking of this meeting. In case there is more than one meeting during the course of the Work package the WP leader can select another IBSE Expert Consortium member who is not a WP leader to take the minutes.

B.2.1.6. IBSE Expert Consortium

Every project partner will delegate one representative to the IBSE Expert Consortium. Each partner will have one vote and the body will decide with majority vote. The IBSE Expert Consortium is responsible for:

- Decisions on the admission of additional members to the consortium. These members may consist of staff from partner institutions or other LOTC sites. Additional members will be responsible for their own costs.
- Conflict resolution between consortium members
- Decisions about the work and task allocation between partners
- Adjustments to the work plan and re-allocation of resources based on the recommendations of the Project Management Team.

The IBSE Expert Consortium will meet on a regular basis in Consortium Meetings or in the case of unexpected problems, and if requested by at least four members of the IBSE Expert Consortium, there will be an additional Consortium Meeting. The IBSE Expert Consortium is responsible for accomplishing agreed work on time. It is also responsible for agreeing quality standards and setting up deadlines and schedules for handing in work.

Consortium Meeting:

In addition to partner representatives, the IBSE Expert Consortium Meetings will include 1 delegate from each participating Advisory Group. This can be the same person or an additional one. Particular meetings may also be further enlarged by additional members selected by the Advisory Groups (e.g. representatives of the local or national school authorities and /or teachers and head teachers from participating schools).

B.2.1.7. Advisory Groups (AG)

Advisory Groups will be established in 11 European Partner countries. They will be managed by the Advisory Group Manager (AGM) who will be the Partner signing the contract.

AG Composition:

Each AG has to consist of at least one head teachers, two teachers, one representative of the local education authority and one botanic garden educator. Including a representative of a teacher training institution and science education researchers is recommended. A List of AG participants will be send to the Management Board by each group manager by the end of month 4.
AG duty:

AGs will meet on a regular basis (twice a year) to learn about new project developments and outcomes achieved. This group will advice the Advisory Group Manager in all matters concerning the national as well as local school curriculum, teacher training requirements as well as teachers needs. School teachers, head teachers and education authorities are selected by their profession and their commitment to work in the project voluntarily AG members may be given the opportunity to accompany the AGM abroad to attend a Consortium Meeting or to participate in the final conference.

Advisory Group Managers (AGM)

The AGM is responsible for:
- setting up an advisory group of teachers, botanic gardens educators and representatives of the school authority. Including a representative of a teacher training institution and science education researchers is recommended.
- Inviting AG participant to a meetings at least twice a year
- Summarize meeting outcomes and recommendations to discuss national requirements during consortium meeting

Advisory Groups running in four of the countries will be coordinated by more than one Partner:
- In UK the AG will be run by Kew, KCL and BGCI
- In Germany the AG will be run by SBZH, UniHB and BGRHB
- In Spain the AG will be run by UAH and CSIC
- In Portugal the AG will be run by UL and FCTUC

In UK, KEW will be responsible for running the INQUIRE course at the Royal Botanic Gardens whereas KCL will be responsible for inviting people engaged in education research and science curriculum planning to AG meetings. BGCI will join these meeting to be kept informed for conveying information.

In Germany SBZH and BGRHB will run the pilot INQUIRE course while UniHB will be responsible for the formative assessment of the pilot INQUIRE course, run the Advisory group and serve as an important link to national curriculum planners.

In Spain and Portugal all four Partners will run the pilot INQUIRE course.

All Partners have contacted the school authorities in their country and are in discussions about how the training course can be linked to regional continuing professional development for teachers. Several gardens have received letters from their authorities stating their commitment to supporting this course.

B.2.1.8. Consortium Partner (LOtC Institution)

Consortium partner’s duties are:
- Administering an Advisory Group in the country
- Cooperating with an official teacher training institution to implement the INQUIRE course in their training program
- running one professional development workshop for other botanic garden and LOtC educators in-country to promote the use of IBSE materials with teachers
- running the pilot INQUIRE course for teachers and educators twice one in the second year, one in the third year
- acting as a ‘mentor’ to botanic gardens, Natural History Museums, Science Centres in-country
- feeding back news about the project to BGCI for production of an E-newsletter, translating the E-newsletter (approximately 1,500 words) twice per year into the local language and sending this back to BGCI for inclusion on the website.
- supporting INQUIRE course participants to carry out reflective practice while participating in the course
- attending the Inaugural Meeting and 4 Consortium Meetings over the three years (2 days/ nights including arrival and departure) plus one final conference (two days)
- writing up own outcomes and supporting teachers to also write up outcomes and present at the final conference
- writing reports about INQUIRE trainings and other dissemination activities for the interim and final reports

B.2.1.9. Communication flow

The systematic and timely implementation of information flow is central for any consortium based project. The communication flow between INQUIRE members will be implemented by:

- Periodic meetings of the Management Board (Quality Manager, Project Manager, Project Coordinator and Work Package Leaders)
- At least one Consortium meeting (= working session) in each WP
- Skype, phone, e-mail interchanges (day to day cooperative working infrastructure)
- Web portal presenting the status of the project
- Web exchange platform
- project handbook: a website restricted to partners access to exchange date, information ect.

The electronic meetings via skype/phone/e-mail will ensure the work is coordinated. Physical meetings will guarantee the personal involvement of the partners. The web portal and the storage of all project related information and documents will keep the partners informed and will avoid information overload by e-mail.

B.2.1.10. Evaluation Process

The work progress of the project will be monitored and supervised by the Project Coordinator and the Quality Management according to the quality management requirements and standards agreed upon.

✪ Quality Management Plan

A Quality Assurance Manual will be produced in the first three months to guarantee excellent development of the EU Support Action. The Consortium will agree on this manual as a part of the consortium agreement in month 4.

The main objective is to ensure the optimal quality of the INQUIRE deployment and deliverables. The Quality Assurance Manual will be developed and supervised by partner KCL: Prof. Dr. Justin Dillon, King’s College London and Partner Prof. Dr. Doris Elster, UniHB.

See WP 7 Quality Management and Partner description.

✪ Project Handbook to track progress:

The Project Handbook (web based domain) will only be accessible to project partners. Each partner will be allocated an individual password to enable them to upload and download information, exchange high data material, pictures, meeting schedules, deadline etc.

✪ External evaluation

An external evaluation is planned and will be subcontracted in the LFU budget.

The External evaluator will not carry out research on project outcomes to come up with his report but will do a summative assessment on data provided by people working in the project. He will look closely at what happens in course of the project, eg. look at the course design, the feedback from teachers etc. but will not generate data himself (eg. use his own questionnaires, teacher interviews etc) because a SSA does not fund research activities.
The External Evaluator will join the first Management Board meeting (via video conference) and one project meeting each year starting with the second consortium meeting month 10 when most of the research framework (practitioners reflective practice and the formative and summative evaluation design) will be in its final stage of development. He will join in again after the pilot courses have been finished (month 24) and will attend the Final Conference (month 32).

He will be responsible for writing the external evaluation reports: an interims report will be prepared in month 23 - 24 and a final report in month 33-36 of the project.
B.2.2. Beneficiaries:

B.2.2.1. University of Innsbruck, Institute of Botany, Austria (LFU)

Person responsible for project:

Dr. Suzanne Kapelari

**Expertise** Dr. Suzanne Kapelari is head of education at the Botanical Garden in Innsbruck. She holds a teachers degree in Biology (secondary and high school), a PhD in Cell Biology and has completed training in project management. Suzanne Kapelari is very experienced in creating teaching resources, organising teacher training seminars as well as evaluating teaching and learning processes. She works in science education research as well as projects concerning public relation activities for the University and the University Botanic Gardens. As head of education at the Botanic Gardens she is responsible for designing teacher training courses and education programmes and is responsible for 10 freelance educators and 2 staff members. She was coordinator of the EU PLASCIGARDENS project (Project Number 020577) between October 2005 and December 2007.

**Relevance of garden to education and conservation** The University of Innsbruck (Austria) is organised in 15 faculties and covers a broad range of research and teaching areas (24,000 Students, 3800 staff members). The Institute of Botany is one of the major institutes of the Faculty of Biology. Infrastructure includes the Botanic Garden with an area of 2 ha and the Alpine Garden Patscherkofel. The Institute of botany consists of two departments: Physiology and Cell Physiology and Systematic; Palynology and Geobotany and engages in various national and international research projects. The University Botanic Gardens engage in international seed and plant exchange. They are members of Botanic Garden Conservation International (BGCI) and of the German Botanic Garden Association “Verband Botanischer Gärten e.V.”.

**Educational activities** Since 2000 the Botanic Garden has been offering special education activities for children and young adults between the ages of 3-18 years focusing on innovative teaching methods. Education at the Botanic Garden in Innsbruck concentrates on active learning in various ways through interdisciplinary programmes. The number of pupils and adults taking part in these education programmes has been increasing continuously. Since 2000 8000 participants annually attend educational programmes and garden festivals.

In course of running PLASCIGARDENS the Botanic Garden has established itself as an innovative informal education institution. A PhD student prepared a thesis evaluating the Austrian PSI topic “Experiments with plant growth” and completed his work in June 2008. Project presentations have been delivered at various national and international education meetings and a good partnership has been developed with the regional school board, the “Pädagogische Hochschule” and the University Education Department. This has enabled the garden to integrate its ideas on informal and context based learning into formal teacher education and training. The Pädagogische Hochschule (PHT) is now using ‘Plant Scientists investigate’ materials in its training as well as coming to the Botanic Garden with students on a regular basis. The University has also included a new lecture called “Inquiry Learning” into the newly designed curriculum for biology teachers. The Botanic Garden education team is currently working in four Science Education Research projects: Formative assessment of two Sparkling Science projects: TopKlimaScience and Alien Invader, IBSE in Informal Education Institutions and Science Research Interpretation.

Because a good cooperation with PHT, the leading teacher training organisation in Tirol, has been established already INQUIRE teacher training courses will be promoted and implemented together
B.2.2.2. Botanic Garden Conservation International (BGCI)

Person responsible for project

Julia Willison

Expertise

Julia Willison is Head of Education for BGCI and has worked in environmental education for over 20 years. She has a MSc in Environment and Development Education and has extensive experience in training and curricula development with botanic gardens.

Relevance of BGCI to conservation and education

BGCI is the world’s largest network for the conservation of plant diversity. The mission of BGCI is ‘To mobilize botanic gardens and engage partners in securing plant diversity for the well-being of people and the planet’. BGCI has played an essential role in the development and ultimate adoption by 188 governments of the Global Strategy for Plant Conservation (GSPC), which has changed the political face of plant conservation and transformed the way biodiversity targets are set at the international level. Networks supported by BGCI now exist in all regions of the world, bringing together botanic gardens with an astonishing wealth of knowledge and experience to share. BGCI runs a unique database on endangered plants, which has documented over 80,000 species in cultivation in botanic gardens. More than 10,000 of these are under threat of extinction in the wild. BGCI’s highly regarded education programme has been running for over 20 years. Its activities focus on information sharing, knowledge transfer and capacity building for plant conservation and sustainability.

Educational activities

Through its education programme BGCI reaches hundreds of educators working in botanic gardens worldwide. BGCI also has strong international links with educators working in other institutions such as universities, zoos, museums, natural history museums and national parks. BGCI’s education activities include:

- Production of a biannual education review *Roots*, which contains articles in English, French and Spanish
- Promotion of education and awareness about plant diversity. BGCI is the facilitating partner for Target 14 of the Global Strategy for Plant Conservation which is concerned with ‘the importance of plant diversity and the needs for its conservation incorporated into communication, educational and public-awareness programmes’. In 2006 BGCI coordinated six national meetings to look at the implementation of T14. The outcomes of these meetings were presented to an international meeting held in Dublin, Ireland that has reported to the Subsidiary Body on Scientific, Technical and Technological Advice to the Conference of the Parties of the CBD.
- Development and production of policy guidelines, on how to educate people on subjects such as sustainable development. The title *Education for Sustainable Development: guidelines for action in botanic gardens* was published in 2006
- Creation of educational materials and resources. The most recent resources are on Plants and Climate Change
- Management of BGCI’s education website ([www.bgci.org/education](http://www.bgci.org/education))
- Development of effective plant-based education programmes with partners around the globe
- Organisation of an international education congress every three year. These congresses bring together hundreds of educators to focus on issues concerned with plant-based environmental education
B.2.2.3. King's College London University (KCL)

Person responsible for project

Prof. Justin Dillon

**Expertise**

Prof. Justin Dillon is Professor of Science and Environmental Education at King's College London. He has taught in schools for 9 years and at university level since 1989. He has directed many research projects and played a major role in international projects in Europe and elsewhere. He is the President of the European Science Education Research Association (ESERA) and an editor of the International Journal of Science Education.

**Relevance of KCL to education and educational activities**

King's College London's Department of Education & Professional Studies is a place where groundbreaking research, world-class teaching and an extremely talented student body are brought together in one of the country's leading centres for the study of education. King's College London science education group has been at the cutting edge of science education in the UK and elsewhere since the days of Nuffield Science in the 1970s and 1980s. Since then, King's College London's work on Cognitive Acceleration through Science Education, Assessment for Learning, Science Investigations (for example, the AKSIS project) and Argumentation (the IDEAS project) have led the field and have heavily influenced the science curriculum. Beyond 2000, edited by Jonathan Osborne and Robin Millar (York) was a seminal examination of the future of science education and it continues to influence curriculum development in the UK and overseas. A later report, Science Education in Europe: Critical Reflections (2008), written by Jonathan Osborne and Justin Dillon, continues to influence science education policy in Europe and elsewhere.

With Jonathan Osborne as past-President of the US National Association for Research in Science Teaching and Justin Dillon as President of the European Science Education Research Association and co-editor of the *International Journal of Science Education*, King's College London's influence continues to spread across the globe. King's College London was a key partner in the Centre for Informal Learning and Schools (CILS), a US National Science Foundation funded ($11m) collaboration with the University of California Santa Cruz and San Francisco Exploratorium. CILS work was at the forefront of research into links between science learning in schools and beyond.

CILS has established a substantial body of researchers working on science learning in both formal and informal contexts. King's College London has carried out research in and with the London Science Museum, the Natural History Museum, Tate Modern and many other regional museums, science centres and botanic gardens. King's College London's work in environmental education research continues to grow with projects funded by the Royal Society for the Protection of Birds, Farming and Countryside Education, the Field Studies Council, the Department of Education and Skills, etc. Justin Dillon plays a key role in two on-going EC-funded projects, *Interests and Recruitment in Science and Technology* (IRIS) and *Towards Women in Science and Technology* (TWIST).
B.2.2.4. Museo Tridentino di Science Naturali, Trento, (MTSN)

Person responsible for project

Mr. Costantino Bonomi BSc., MPhil.

Expertise

Mr. Costantino Bonomi BSc., MPhil. Is Head of Botany and Curator of the Botanic Garden. He has participated to two EU FP6 projects: Ensconet (RICA-CT-2004-506109) and Plant Science Gardens (2005-020577). Dr. Bonomi has designed and conducted education programmes since 1997, employing interactive hands-on activities and active learning techniques. Other staff involved in the project will include Ms. Raffaella Giacomolli (senior education officer), Ms. Serena Dorigotti MSc. – (Assistant education officer), Ms. Marina Galetto MSc. (Teacher Liaison Officer for the museum) and Ms. Maria Bertolini MSc. (Head of Education for the museum)

Relevance of Museum and Garden to education and conservation

MTSN runs two botanic gardens: Viotte Alpine Botanic Garden on Mt. Bondone and Arco Arboretum. The former has a special focus on native threatened endemic alpine species and actively sources and banks their seeds, experimenting their germination, propagation and cultivation. Arco arboretum conserve a mature collection of fine trees and shrubs of garden interest.

Educational activities

The education programmes started in 1997 aimed both at schools and tourists. The programme involves a range of activities that utilise active learning and enquiry based techniques. As part of its involvement in the past EU FP6: PLASCIGARDEN Project, MTSN developed a specific module on extinction and conservation. MTSN mainly targets schools and teachers via a specific handbook illustrating all the education programmes. The annual programme is presented during a three days education fair held annually at the museum. Teachers are involved in planning and improving the education activities offered. A school liaison officer, being a teacher based at the museum, facilitates the development of special projects with individual teachers and schools. The detailed education programme offered to schools can also be found at www.mtsn.tn.it/perlascuola

The number of pupils taking part in the education programmes has continuously increased since its beginnings back in 1997. Over the last 10 years, nearly 20,000 pupils have attended the Botanic Gardens education programmes. MTSN is annually visited by 75,000 pupils taking part in education in more than 160 different programmes. MTSN is officially recognised by the Regional School Authority as an institution qualified to offer Continuous Professional Development and training courses to teachers and educators. Annually no less than 10 CPD and training courses in natural science are offered to local teachers with an average of 200 participants.

Facilities

Viotte Alpine garden has two education centres capable of accommodating up to 30 pupils each. Viotte Alpine garden offers all the facilities necessary for interactive and experimental activities. Arco Arboretum has no indoor facilities but thanks to the mild climate it can accommodate pupils in two gazebos that can offer an equally comfortable learning environment that can be equipped with all that is needed for education.
B.2.2.5. Royal Botanic Gardens Kew (KEW)

Person responsible for project
Mrs Gail Bromley MSc. MBE FL

Expertise
Gail Bromley is an International Consultant for Biodiversity Education. She set up and ran Kew’s education department for over 15 years. Gail is currently developing Community Education and develops and manages educational projects, acting as a consultant for biodiversity education issues within Kew. Gail participated in the EU project – PLASCIGARDENS (2005-020577). She was the principal author of the teaching activities in Kew’s latest educational project ‘The Great Plant Hunt’. Other staff will include Mrs Christine Newton BSc, PGCE and Head of Children and Families Section at Kew and Wakehurst Place, Mrs Sue Hunt BSc PGCE– CPD and Education Development Officer and Dr Amber Waite, Schools Programme Manager, Kew Gardens.

Relevance of garden to education and conservation
The Royal Botanic Gardens, Kew is a World Heritage Site (www.kew.org) and comprises two sites with over 420 hectares of landscaping, living plant collections of over 30,000 species, an Herbarium of over 7 million specimens, 75,000 botanical artefacts, a World Seed Bank housing over 1 billion seeds and conserving over 10% of the world’s higher plant species, 42 Historic Buildings and a permanent staff of over 650. Kew is regarded as one of the foremost plant science institutes in the world and is the National UK Botanic Garden.

Educational activities
Kew employs nine permanent education staff and over 50 contract teachers with experience in primary, secondary and tertiary levels. Programmes focus on building awareness about the vital need for plants and their habitats and provides its varied audiences with tools, such as critical thinking skills, knowledge and understanding. Over 90,000 schoolchildren and educationalists visit Kew annually. Kew launched a major schools resource in 2009, providing over 23,000 schools with a re-useable 12 month series of activities based on the development of Darwinian skills in primary school children. The resource included further web based interactive learning tools and a large number of practical materials for the delivery of plant science in the classroom such as a plant press and mini seed bank (www.thegreatplanthunt.org).

Collaboration with formal schools system
Kew works with several local education authorities. As the UKs National Botanic Garden, Kew has extensive reach to many national educational institutions including the National and Regional Science Centres, and Teacher Training Institutes. Kew is registered with educational organisations as a site for Continuous Professional Development. The organisation hosts the secretariat of the UK Botanic Gardens Education Network (BGEN) providing excellent interaction with over 200 UK botanic garden educators.

Facilities
Kew houses a number of educational facilities, including lecture theatres and dedicated suites of training rooms (ranging from 25-50). The large area within the two garden sites of RBG Kew (Richmond and Wakehurst Place) along with considerable glasshouse and science laboratory facilities, offer space necessary for interactive and experimental activities. Kew additionally has a number of ‘yurts’ available for outdoor school activities.
B.2.2.6. Agencia Estatal Consejo Superior de Investigaciones Cientificas (CSIC)

Person responsible for project

María Bellet Serrano.

Expertise

María Bellet Serrano is Head of Education at the Royal Botanic Garden, Madrid and has worked in environmental and scientific education for eight years. The Garden staff who will support the project are biologists, forest engineers or similar. Two persons will collaborate occasionally and without cost for the project, but their work will be very important for the project: Esther García, who is responsible for Scientific Culture Department, which includes the Education Area, and Irene Fernández de Tejada, who has been working in the education team for several years.

Relevance of Garden to conservation and education

The Royal Botanic Garden, Madrid was founded in 1755. The education programme is supported by the research centre, which is the main botanical research institution in Spain. The goal of research undertaken at the botanic garden is to understand the diversity of plants and fungi that exists, how this diversity has come about, and how it can be conserved. Education is a major role of the botanic garden and the education staff deliver programmes to more than 50,000 people each year. The education programme also participates in educational events such as the Madrid Science Week and the annual Science Fair.

The Spanish Agencia Estatal Consejo Superior de Investigaciones Cientificas (CSIC) - is the largest public multidisciplinary research organisation in Spain. Under the 6th Framework Programme, the CSIC has signed 418 contracts (37 coordinated by the CSIC).

Educational activities

The garden offers a range of education programmes: schools workshops, public activities, adult and family workshops, guided tours for school groups and general public, volunteer guided tours, Science Week, Science Fair, interpretation and specific collaborations with other programmes or institutions (Jane Goodall Foundation, Goethe Institut, etc). It collaborates with the formal schools system in many ways and has a close relationship with the Regional Training and Innovation Centre for Teachers – CRIF “Las Acacias”.

Facilities

The botanic garden is 8 ha in size and contains around 4000 plant species. For use in education, the garden has a lecture room with capacity for 70 people, an assembly hall with capacity for 140 people, a classroom and a computer room with up to 20 computers.
B.2.2.7. University of Bremen (Uni Bremen)

Person responsible for project

Prof. Dr. Doris Elster (Head of the Department)

**Expertise**

Doris Elster is researcher and science educator at the University of Bremen. She is the Head of the Institute of Science Education, Department Biology. She is professor for science education and responsible for pre-service education of teachers of the secondary level. Her core field of research is about teacher’s professional development in communities of practice. She has investigated the processes of school based reforms e.g. the implementation of the national educational standards in the science domain in Germany and Austria.

In pre-service and in-service biology teacher education Doris uses inquiry-based methods and evaluates their effects in learning circles. She and her team develop and test inquiry-based materials and concepts with school partners as well as with out-of-school institutes such as the Green Science Center Botanica. Doris Elster was partner in several European projects: Comenius 2.1 CROSSNET (Crossing Boundaries in Science Education), Comenius 2.1 GIMMS (Gender, Innovations, Mentoring in Mathematics and Science), Comenius 2.1 EUDIST (European Development of Integrated Science Teaching). She was German/Austrian partner of the international ROSE project (The Relevance of Science Education) which investigated the interest of young people in more than 40 countries.

**Relevance of institute to education**

The Institute of Science Education (IDN) at Bremen University consists of the three departments - physics education, chemistry education and biology education - with about 15 scientific members. The overwhelming tasks to be pursued by the IDN include the provision of research, development and consultation in the sphere of teaching and learning, as well as in the provision of continuing teacher development.

The IDN-Biology is committed to establish a close link between theory and practice ensuring a balanced relationship between a biology-specific and an interdisciplinary approach, taking into account gender mainstreaming and gender sensitiveness and maintaining a balance of action and reflection, as well as autonomy and networking.

**Educational activities**

In the project INQUIRE Doris Elster will support inquiry-based teacher training and research on national and international level as an expert of in-service teacher education in communities of practice. She will be the partner of the Green Science Center Botanica in Bremen where teachers (and their pupils) develop, test and reflect on inquiry-based materials and concepts in student-relevant contexts. She will be responsible for conducting teacher training seminars and the dissemination of INQUIRE teaching resources as well as newly gained knowledge in Germany.
B.2.2.8. University of Sofia Botanical Gardens (UBG)

Person responsible for project
Dr. Krassimir Kossev

Expertise
Dr. Krassimir Kossev is Director of the University Botanic Gardens and holds an International Diploma in Botanic Garden Education. He participated in the EU project – PLASCIGARDENS (2005-020577) and is responsible for disseminating project outcomes in Bulgaria and other Balkan States including new EU members as well as candidate states. Other staff involved in the project will include Ms D. Ljuba Pencheva, who worked as an Education Officer on the PLASCIGARDENS project and conducted CPD training courses for primary school teachers. Ljuba has continued to work in UBG as an ‘education specialist’, working with ‘Plant scientist investigate’ modules and adapting some of them for 4-7 year old children. She also organised student placements for students from the Department of Information and Training of teachers at Sofia University.

Relevance of garden to education and conservation
The University of Sofia was the first higher educational institution in Bulgaria. Its history is an embodiment and a continuation of centuries of cultural and educational tradition in Bulgaria. The University Botanic Gardens comprises three Gardens in three different cities with collections of more than 2,500 species:
● University Botanic Garden – Sofia
● University Botanic Garden – Balchik
● University Botanic Garden – Eco Park – Varna
The University Botanic Garden carries out scientific research and organises ecological education programmes with various target groups. The main aim of UBG is to provide information about the Plant Kingdom and develop educational activities for the conservation ex situ of rare and endangered plants. The gardens are members of the Botanic Gardens Conservation International (BGCI).

Educational activities
During the course of the PLASCIGARDENS project mutual cooperation was established between the botanic gardens and the schools in Bulgaria. In connection with the requirements for the EU membership of Bulgaria, the Ministry of Education and Science has prepared syllabuses that include a wider scope of methodological skills, among which inquiry and context based teaching techniques are included. Our knowledge in the experimental phase of the PLSG Project, however, shows that in the Bulgarian schools most of the teachers are not ready to apply these methods and do need professional training. The additional workshops and materials will be very supportive in this process.

Collaboration with formal schools system
During the INQUIRE project UBG will do their best to establish better communication and practical interaction between the Ministry of the Education, Youth and Science in Bulgaria.
B.2.2.9. National Botanic Garden of Belgium (NBGB)

Person responsible for project

Dr. Gert Ausloos, Head of Education

**Expertise**

Dr. G. Ausloos, botanist, started the present educational programme in 1998. He has university teaching experience (1990-1996, K.U.Leuven, Belgium) and was involved in the formal evaluation of the university practical exercises (1997). Koen Es recently became responsible for the formal education aimed at the Flemish region and the Garden will employ, in early 2010, a new collaborator responsible for formal education in the French speaking region of the country.

**Relevance of garden to conservation and education**

The mission of the National Botanic Garden of Belgium consists of three parts, conducting research on plant species, contributing to the global conservation of plant species and educating all members of the public on the importance of plants. The Garden has about 200 collaborators; gardeners, scientists, illustrators, horticulturalists, historians, technicians, educators and guides, working every day to study and protect the Plant Kingdom. Research wise the Garden is focused on the Coffee family (Rubiaceae) and the flora of Central Africa. The foundations of the different areas of work of the garden are the collections it holds. Notably the Herbarium, 4,000,000 documented specimens of dried plants from every corner of the world. The Library; holding over 200,000 volumes and the Living Collections, comprising about 18,000 different kinds of plants. The various glasshouses hold around 10,000 kinds and the arboreta, gardens and collection areas in open air hold approximately 8,000. The Garden attracts approximately 120,000 visitors per year. The Garden is an active member of various national and international networks, eg.PLANTCOL, a database to give the public access to the living collections of Belgian botanic gardens and arboreta; the European Native Seeds Conservation Network (ENSCONET) and the global network of botanic gardens, Botanic Gardens Conservation International (BGCI).

**Educational activities**

At present the National Botanic Garden of Belgium runs school workshops both for primary (4) and secondary schools (6), in both languages (Dutch and French) of the country. Workshops cover subjects like tropical rainforest, evolution, biodiversity and wild plants. The workshops are permanently evaluated through teacher feedback. The Garden receives about 7,000 school children a year; twenty freelance animators conduct the school workshops. During recent renovations extra attention was given to develop zones within the living collections (glasshouses and gardens) equipped and planted for educational activities of various levels. In the past the Garden has had links with University educational research. The last project was the web based multi disciplinary tool “www.regenwoud.com” which was later transformed into “Jengi” by WWF Belgium. More recently the Garden was involved in the task-group charged with formulating recommendations to develop a new set of biology goals for both primary and secondary. An education officer of the Garden collaborated with representatives of the Department of Education, teachers and education researchers. In June 2008 the results and recommendations of this task force were finalised and presented to the government. More information on the National Botanic Garden of Belgium can be found on our website [www.plantentuinmeise.be](http://www.plantentuinmeise.be)
B.2.2.10. Schulbiologisches Zentrum Hannover (SBZH)

Person responsible for project

Jörg Ledderbogen, Dipl. Biol. (M.Sc.)

Expertise

Jörg Ledderbogen holds a master degree in biology. Working in the SBZH since 1991 he is now in the role of the curator and deputy director. He has a long experience in creating pedagogical garden sites as well as designing and conducting education programs with pupils, students, teachers or visitors. The teachers of the Centre include seven fully educated teachers of all types of schools, mainly working in the Centre but also teaching at schools for some hours a week. In addition 5 teachers or biologists work as temporary employees.

Relevance of garden to education and conservation

The School Biology Centre (SBZH) consists of four departments: the Zoo School in the zoo, the Burg Open Air School (6 ha of forest), the Burg Botanical School Gardens (7 ha) and the Linden Botanical School Gardens (2 ha). The gardens include natural sites of several hectares with forest, ponds and meadows as well as a e.g. pharmacist’s garden, vegetable garden, genetic garden, insect garden, a tropical greenhouse for lessons, a vineyard and many more. It is the biggest environmental education centre in Germany, created and run to support vivid school education since its origin in 1882.

Educational activities and links with formal school system

SBZH is part of the city government’s school department. Our main activities include:

- in-service training of disseminators: teachers for primary school to secondary or high school as well as teachers for nursery schools (27 teacher training courses with 230 teachers in 2009)
- training of pedagogical university students and help during their probationary period (60 seminars, approx. 1150 students)
- classes for all ages for all regular schools of Hannover (1300 classes, 27 000 persons) and lessons for kindergartens (100 groups, 1400 children), using the gardens and animals
- supporting all schools and teachers of Hannover region with plants, animals, models, measuring instruments
- giving help and plants for the landscaping of school grounds and gardens
- apprenticeships for twelve gardeners which propagate the plants for the schools.

Direct contact with the lesson’s subject is one of the principles of all pedagogical work. All the gardens are created in the knowledge that ‘using’ sometimes means ‘damaging’. We support a ‘practical understanding of theory’ and achieve a consciousness of being involved in nature: ‘I’m part of it’. Environmental Education and Education for Sustainable Development have always been the basic principles of our work. SBZH regularly holds teacher training courses and in-service courses for teachers of all types of schools and of kindergartens. Internal training events, where the entire staff of a school uses the Centre for their staff development programme, have also proven very successful. The teachers mostly come from the city and region of Hannover, some from the state of Lower Saxony. SBZH has a contact person in each school of Hannover.

Facilities

All four departments of the SBZH have in total 10 class rooms for classes and teacher training. All parts of the gardens are created for lessons in plain air with groups of about 30 persons. The necessary technical equipment is available in the Centre.
B.2.2.11. Jardin Botanique de la Ville de Bordeaux (BORDEAUX)

Person responsible for project
Réjane BRUN

**Expertise**
Réjane BRUN is the head of educational service at Bordeaux Botanic Garden. She has organised and developed the education program since 1999. Réjane obtained a master of ecology in the University of Bordeaux (Biology of populations and ecosystems) in 1998 and a state diploma of education in 2004. Other staff include:
- Dr. Jonas BANIAKINA (since 2003) PhD. in biology and a medicinal tropical plants specialist.
- Melissa GARRIGUE (since 2006), state diploma on environmental education,
- Marjorie DURAND (since 2007), a gardener with a diploma of tourism and environmental education.

**Relevance of garden to education and conservation**
Bordeaux Botanic Garden is one of the oldest French botanic garden (1629). The BBG is divided into two spaces, the old one, a systematic garden, in a park of the city centre, and the new garden in the Bastide district. The main conservation activities are programmes in collaboration with territorial and national authorities to undertake a complete inventory of the regional flora. The herbarium is a rich resource housing 700 000 specimens and 7 500 volumes in the library. The greenhouses hold species of the Mediterranean flora from the both hemispheres and exhibitions rooms show a permanent exhibition on the history of botany and temporary exhibitions on many other subjects. 130 000 visitors a year are received and about 10 000 school children and students.

**Educational activities and links with formal school system**
The garden offers a large range of educational programmes: several projects and workshops with schools and children. Staff lead projects at several levels with the regional education system, and educators are involved in teacher training. Scientific and technical information is shared with the aid of educational tools such as visits, workshops, publications, exhibitions, courses, practical sessions, etc. The education staff also offers specialized training for personnel and professional development for technicians. The garden offers a wide range of guided tours for all kinds of groups. During the “Classes vertes” children from 5 to 6 years old stay during a whole week to learn and spend time in nature. The education group is also in charge of the exhibitions and different events.

**Facilities**
The garden area is 6 ha, divided into five main parts, in which some natural habitats are recreated. It boasts a conference room with a capacity of 55 people, an educational room, gardening facilities for young people and a laboratory with excellent equipment.

http://www.bordeaux.fr/ebx/portals/ebx.portal?_nfpb=true&_pageLabel=pgSomRub11&classofcontent=sommaire&id=2099
B.2.2.12. Coimbra Botanic Garden (FCTUC)

Person responsible for project

Ana Cristina Tavares

**Expertise**

Ana Cristina Tavares is a Biologist, with a Masters in Plant Physiology. She will be responsible for the project, with the assistance of the staff of the Department of Life Sciences of the University of Coimbra. Ana Cristina was teaching assistant at this Department (1986-1992) and is currently Head of the Sector of Education of BGUC. She has developed educational and training volunteers programmes for more than 10 years and her experience is highly relevant to run the Portuguese contribution of this proposal. Ana Cristina holds an international diploma in Botanical Garden Education. She delivers lectures, writes publications and participates in congresses.

**Relevance of garden to education and conservation**

BGUC promotes nature conservation and sustainable education by organizing a number of activities and programmes to raise public awareness and increase children’s motivation. In this context, BGUC Section of Education develops different educational and cultural initiatives, mostly targeted at schools and educational institutions to raise environmental issues and the urgent need to protect and to preserve it. The Botanic Gardens sees itself as a school for life-long learning, offering living models to learn and understand botany and the importance of plants to sustain the living systems.

**Educational activities**

The educational Section at BGUC has been running since 1997. It has developed an annual programme which offers 10 permanent themes and more than 12 seasonal themes. Different schools visit the BGUC coming from all regions of the country - North to South. The main goal of this programme is to follow the school curriculum of the different year’s levels and to apply them in the garden, using formal and informal educational systems and using the living specimens of the plant collection for models and experiments. ‘Hands-on’, ‘head-on’ and ‘heart-on’ is the thinking used to involve visitors interacting with the garden. The number of guided visitors per year averages 10,000. In May 2007, BGUC organized the IX AIMJB (Associação Ibero-Macaronésica de Jardins Botânicos), Symposium. The theme for this conference was ‘Education and dissemination of natural sciences’.

**Collaboration with formal schools system**

The education programmes of BGUC are developed following the main guidelines of the Ministry of Education, emphasizing BGUC’s role in complementing the formal education at schools.
B.2.2.13. Moscow State University Botanical Garden (MSU)

Person responsible for project

Dr. Alla Andreeva, PhD, Head of Education, Deputy Chair of the Environmental Education Commission under the Russian Academy of Sciences’ Council of Russian Botanic Gardens

Expertise

Dr. Andreeva is a senior scientist in biology and ecology, head of education (more than 20 years working in education). She is author of various educational programmes and a textbook entitled “Nature Study. 5th Year” for general educational schools. Other participants of the project will be Prof. Zernov Alexander, Dr. Kosenko Yana, PhD, Nesterova Anna - qualified educator, Lazareva Nadezhda- qualified educator, Dr. Rappoport Alexandre – PhD.

Relevance of garden to education and conservation

Russia’s oldest botanic garden (1706) now has 2 territories: the oldest garden, named “Aptekarskiy ogorod”, which is home to over 2,500 species from around the world, with its leafy arboretum and historic glasshouses covering approximately seven hectares in the centre of Moscow. The mission of the garden is ‘education for conservation of biodiversity and sustainable development’. The Botanic Garden of MSU participates in and coordinates projects on biodiversity conservation of the native flora of Russia and runs different educational programmes for schoolchildren, university and college students, general public, educators and specialists. The Garden grows 105 rare and endangered species included in the Red Data Book of Russian Federation, 60 species included in the Red Data Book of Moscow region and 8 species from Appendix I of Bern convention. In 2009, the garden attracted over 300,000 visitors.

Educational activities

The garden runs a range of interactive programmes for children and teachers including educational ecological competitions, guided tours and training courses for Government officials. These activities are supported by manuals and textbooks published by the Garden’s staff experts. The Garden also has its own website: www.hortus.ru; methodological website for theachers and educators: http://education.hortus.ru; methodological website for teachers and educators: http://education.hortus.ru and childrens website: http//ecoclub.hortus.ru. The Garden operates an extensive programme of guided tours devised to meet school standards and aimed at all levels of the school curriculum. Since 1998 the Garden has successfully operated an environmental education programme for Moscow schools entitled “Lessons in the Botanical Garden”. These lessons are offered to pupils to provide them practical research skills in the fields of biology and ecology. Over 50 Moscow schools are involved in the programme. Garden staff work closely with teachers, providing advice, conducting regular workshops, speaking at teachers’ conferences, and developing teaching manuals and other methodological materials for biology and nature studies classes within the school curriculum. Garden staff are regularly invited as experts to sit on juries in various competitions. The project leader, Alla Andreeva, has written a nature studies textbook for 5th form pupils, which is now being introduced in schools not only in Moscow, but across Russia. Moscow pupils using the textbook regularly visit the garden for classes.

Collaboration with formal schools system

INQUIRE content has been agreed with staff in the Education Department and students will be enrolled through local and regional educational departments. Upon completing the course each student will receive a certificate.

Facilities

The Garden has premises that can be used for academic and practical teaching (laboratory; hothouse complex; special thematic plant collections; equipment (microscopes, computer, video projector, screen, boards); beds for experimental plantings; library; methodological website for teachers and educators: http://education.hortus.ru and childrens website: http//ecoclub.hortus.ru
B.2.2.14. Natural History Museum Oslo, Botanical Garden (NHM)

Person responsible for project

Kristina Bjureke

**Expertise**

Kristina Bjureke is a lecturer with the Department of Exhibition and Public Services, NHM. She has a teaching qualification and seven years experience as a biology teacher in secondary school and college. Kristina also has a Master’s degree in botany and lectures on courses at different levels in botany at NHM, UiO. She has lectured at the museum since 1997 and has been responsible for teachers’ courses since 1999. Today two of her main concerns are *ex situ* conservation and the fight against alien plant species.

**Relevance of garden to education and conservation**

The botanic garden is a part of the Natural History Museum (NHM), University of Oslo, which in addition to the Garden also consists of three museums (geology/palaeontology, zoology and botany). One of the goals of the Natural History Museum is to stimulate young people to study science and participate in science projects. Ten years ago, in 2000, a new area was developed in the Oslo Botanical Garden. At the ‘Oslo Ridge’ 100 plant species typical of the calcareous islands and hillsides of the Oslo Fjord are presented. This region is very close to the capital, Oslo, and is considered a biodiversity ‘hot spot’. NHM has educational programmes at the ‘Oslo Ridge’. In the last years NHM has invited school classes to an easily accessible island in the Oslo Fjord. Teaching biodiversity at a characteristic habitat outside the botanic garden has become a popular supplement to the educational programmes in the garden itself. NHM has produced a video about nature on this island, shown twice on television last year.

**Educational activities in the Botanical Garden**

In 2009 the number of visitors to the Garden was 460 000. NHM produces a variety of teachers’ training courses and web-based education modules. Its programmes include classes in world vegetation and climate; biodiversity; pollination biology in the spring and seed dispersal in the autumn; systematics; conservation biology; invasive aliens; economic plants. For the smallest children, NHM presents traditional games involving plants and the life of a tree throughout the year. The main focus to date has been on children aged 12 and older, however there are also programmes for children aged 9-10 years.

**Collaboration with formal school systems**

NHM works in close contact with The School Laboratories in Biology, Chemistry and Physics at the University of Oslo in arranging courses for teachers. On several occasions NHM has co-operated with the Department of Teacher Education and School Development (ILS). The Department of Exhibition and Public Services’ contact with schools and school authorities is extensive. During the last couple of years, the educational authorities of Norway have developed a programme called ‘the cultural schoolbag’. Through this programme NHM has led excursions to a nearby island.

**Facilities**

NHM has the necessary facilities to run classes of various kinds, both in terms of space and technical installations. The Garden is huge, and teaching can be performed in many separate parts of the Garden.
B.2.2.15. Botanischer Garten, Rhododendron-Park, botanika Bremen (BGRHB)

Person responsible for project:

Dr. Hartwig Schepker (scientific director and curator) and Annette Reisenweber

**Expertise**

Dr. Schepker is a trained horticulturist and holds a PhD in plant ecology. Dr Schepker has been deeply involved in the educational concept and the running of botanika for more than 10 years. Mrs. Reisenweber is responsible for education and public relations since 2004. She has a degree in Environmental Biology of the University of Applied Sciences in Bremen. Both produce the yearly programme with guided tours, exhibitions, talks, seminars, school classes, student courses etc

**Relevance of garden to education and conservation**

botanika is Germany’s first Green Science Center focussing on Article 13 of the CBD: "Public Education and Awareness". The extreme variable genus Rhododendron is used to illustrate the meaning of biodiversity for a broad range of visitors including students and scholars. botanika hosts a biodiversity exhibition and includes several greenhouses for practical demonstrations of plant diversity. botanika is situated in the centre of the Botanic Garden and Rhododendron-Park with a size of 46 hectares and has been an integral part of all educational activities in the garden since its opening in 2003. In 2010/11 a new classroom and a laboratory will be constructed to serve as an environmental education centre for extracurricular classes.

**Educational activities**

As well as a wide range of public education, botanika offers seminars for master and bachelor students of both the University Bremen and the University of Applied Sciences. Curricula focusing on botanical, ecological and ethnic topics are developed for all grades of the Bremen school system and are offered on request. botanika is currently collaborating with the University Bremen, Department of Science Education – Biology (master students/master thesis) and “Oberschule Ronzelenstrasse” (1/2 year project courses for different school levels). The unique combination of an environmental education centre with the huge plant diversity in the Botanic Garden and the various garden environments in the surrounding Rhododendron-Park offers enormous potential for multiple teaching approaches. Furthermore, there will be an increasing demand in additional courses with the recent implementation of all-day-schools in Bremen. With the opening of new facilities in 2011 botanika will be a key player for extracurricular classes for students and scholars in Bremen.

**Facilities**

botanika houses two multifunctional greenhouses which can serve as temporary classrooms for practical courses, a ‘green schoolroom’ with binoculars etc., greenhouses and outdoor areas for field studies: Starting in 2011: a new laboratory and seminar rooms.
B.2.2.16. Universidad de Alcalá (UAH)

Person responsible for project

Blanca Olivé de la Puente

**Expertise**

Blanca Olive, botanist, is responsible of the Educational Programme in the Real Jardín Botánico Juan Carlos I. She has designed and developed the Educational Programme since 1995. Educational practitioners, Juan Pedro Zaballos, biologist, is the coordinator of the rest of the education staff and has worked in the programme since 1999. Staff also include around 10 students per year from the University of Alcalá. The education programme is one of the oldest and most developed programmes in Spanish botanic gardens. It runs a huge number of activities (more than 60) and involves local and regional participants. The education programme is supported by the University of Alcalá.

**Relevance of garden to education and conservation**

Real Jardín Botánico Juan Carlos I belongs to the University of Alcalá, in Alcalá de Henares, Madrid. The University of Alcalá was declared a World Heritage Site by UNESCO in 1998. Real Jardín Botánico Juan Carlos I is 26 Ha in size and is located in the Campus of the University. Its principal aims are conservation and education. Its importance for biodiversity conservation is due to the collection of living plants, having the biggest collection of cactus in Spain apart from specific collection of roses, tropical plants, conifers, Spanish trees, regional flora, Cycadales and garden plant. The collection involves near 8000 taxa. Also the importance for conservation is the Seed Bank (near 10000 accessions) and the studies and horticultural practices developed in the garden.

**Educational activities**

The botanic garden carries out educational activities according to the different target groups: formal and informal students from kindergarten through to adults, students with special needs, elderly, groups of adults with special interest on any particular subject and general public. Most of the activities are designed and carried out by the garden itself but also some of them are prepared with the collaboration of other institutions or interested groups.

The education programme has close contact with the formal school system since its inception. Since 1998 there is a Convention with the local school authority (Regional Training and Innovation Centre for Teachers). Another Convention (especially for local schools groups) with Alcalá de Henares Town Council had been running during the years 2008 and 2009. Also botanic gardens collaborate with local schools in International projects such as ‘Key to Nature’ and in local and regional activities such as ‘Science Week’, ‘Science Fair’, ‘Plant Fair’. The education programme also keeps a close contact with education departments in botanic gardens throughout Spain.
B.2.2.17. University of Lisbon, Botanic Garden (UL)

Person responsible for project

Maria Amélia Martins-Loução

**Expertise**

Maria Amélia Martins-Loução is a Professor at the University of Lisbon. She is a biologist specializing in ecology. As head of Lisbon Botanic Garden for 6 years Maria has promoted the Education Office and the openness of the garden towards public awareness of plant conservation. Presently she heads up the environmental education research area at the Botanical Garden and the seed bank. She has been responsible for conservation projects, plant-monitoring programmes and is responsible for various Post-Doc, PhD and master students. Gisela Gaio-Oliveira is a Post-doctoral researcher on Scientific Promotion, focusing mainly on the role of botanic gardens on public awareness towards plant diversity and conservation. Ana Raquel Barata is responsible for school activities using interactive hands-on activities and active learning techniques and for project applications concerning environmental education. She has executed one EU project (POCI/DIV/2005/00210), several national ones and seven projects on the Youth in Action Programme (European Voluntary Service).

**Relevance of garden to education and conservation**

The University of Lisbon Botanical Garden was designed in the 19th century as a scientific garden, illustrating Portugal’s colonial power at the time. The systematic collections serve various fields of botanical research, demonstrating the great diversity of plant forms and various ecological processes. They also represent an important and effective way of conserving plants whose survival is threatened. The garden is particularly rich in tropical species from New Zealand, Australia, China, Japan and South America, illustrating the mild climate and the special microclimates produced in the garden. The Seed Bank keeps rare and threatened species in its collection. Approximately 30% of the Portuguese native flora is already represented in JB-UL current holdings (total of 4134 accessions). The amount of children that visit and learn by playing in the garden now represent more than 10% of the total number of visitors.

**Educational activities**

The Education Office at the garden was established in 2003. It offers hands-on activities focusing on plant diversity conservation and sustainability and targets school groups and the general public. The number of pupils taking part in the education programmes has been continuously increasing since 2004 achieving a maximum of 8500 in 2009. Additionally, more than 12000 pupils visited the botanic garden with their schools every year. The Education Office is also responsible for the development of specific projects (EU and national programmes) integrating an active school network since 2005. As part of the Lisbon University, JB-UL is officially recognised as an institution qualified to offer training courses to teachers and educators, as well as higher education students. This has been offered through different applied courses towards the implementation of botany in schools and to help teachers to recognise plants in the field.

**Facilities**

LBG has two education centres capable of accommodating one class each, with up to 30 pupils each. The garden has all the facilities necessary for interactive and experimental activities.
This project brings together a consortium group who between them offer wide ranging experience, skills and knowledge to facilitate each aspect of the work. Four of the consortium members – LFU, MTSN, UBG and KEW were all project partners who worked on and delivered the previous EU project **PLASCIGARDENS, Plant Science Education for Primary Schools in European Botanic Gardens No 020577.** These partners have already established good working relationships and have been involved in detailed development procedures leading to the successful completion of the project. Having a shared understanding of the previous project outcomes and philosophy will offer both continuity and a sound basis for taking forward this second evaluative stage. These partners will function as mentors for other participants. All project partners are very experienced in participating or co-ordinating international project. Suzanne Kapelari previously co-ordinated the PLASCIGARDENS Project successfully and this will help in enabling smooth project progression.

The botanic gardens and natural history museums, involved in the project bring a shared knowledge of **plant science education** delivery in an informal context. All of the project leaders in each garden / museum work within a number of national and international networks, and can draw on the collective expertise of other botanic gardens/Natural History Museums and Science Centres in their own country and beyond. For example, the gardens in the consortium network closely with other botanic gardens in their countries:

- e.g. Austria = 19, Italy, 104, UK = 106, Portugal 13, France = 97, Norway = 6, Germany = 104, Bulgaria = 3, Spain = 26 , Belgium = 28. etc

Through national meetings, project partners will contact nearly 800 Botanic Gardens in Europe and, through BGCI, many hundreds more worldwide. Site based institutions offer significant learning opportunities for schools and it is highly likely they will be encouraged to participate in the renewal of science education in Europe. They have enormous experience in the delivery of informal teacher training programmes and have a wealth of knowledge and experience relating to the subject matter. These institutions will bring their experiences and in-depth knowledge on biodiversity conservation and climate change to the consortium base and will offer guidance and support for both course development and implementation. Collectively the Partner institutions already reach over 200,000 schools throughout Europe. They will also reach many thousands of teachers through cascade training and CPD programmes. The intention of the project is to include gardens in the consortium of various sizes and with varied resources. This will enable expertise to be shared among members and help to develop the capacity of smaller gardens. Several gardens may have fewer resources but they will also bring fresh thinking to the consortium.

The academic partners have significant experience in delivering European Union projects and working collaboratively in project consortiums. King’s College London has been involved for many years within Tempus (for example, COBES-Bulgaria and COBES-Lithuania), Comenius (for example, the Comenius Freshwater Network) and Socrates programmes. Much of King’s College London’s research focuses on scientific investigations and the OPENS and AKSIS projects were highly influential in the development of the English National Curriculum in the 1990s. The Institute of Science Education (IDN) at Bremen University has been involved in delivering Comenius 2.1 CROSSNET (Crossing Boundaries in Science Education), Comenius 2.1 GIMMS (Gender, Innovations, Mentoring in Mathematics and Science), Comenius 2.1 EUDIST (European Development of Integrated Science Teaching). Doris Elster, Bremen University, was also a partner in the international ROSE project (The Relevance of Science Education) which investigated the interest of young people in more than 40 countries. Both King’s College and Bremen University will bring a sound theoretical basis to the project and scientific rigour in project development, execution and evaluation. They will also provide an excellent bridge between formal and informal learning.

BGCI is the largest international network of botanic gardens and related institutions working collectively for plant conservation and environmental education. Established in 1987 BGCI links over 2500 institutions in almost 120 countries, BGCI provides technical and policy guidance as well as regular up-to-date information through its newsletters, magazines, conferences and courses.

Over the past five years, BGCI has worked with botanic gardens in Africa, China, Europe, India, Latin America, Indonesia and Russia. Members of the consortium are also members of BGCI and collectively the gardens in the consortium have a great deal of experience of working together and internationally on
projects. BGCI and Kew, for example, run the International Diploma Course in Botanic Garden Education which takes place every two years and BGCI has worked with Moscow Botanic Garden on capacity building for Russian botanic gardens in education for sustainability. Partners in the consortium already know each other and are keen to work together in this project. This will facilitate the project’s development smooth operation.

Third Party:

Partner 16. Universidad de Alcalá (UAH) will apply a Third Party Type A as following:
The Botanic Garden belongs to the University of Alcalá, which is partner in the project. Therefore the Botanic Garden and the UAH have the same legal personality

The University will hire a person who will work in the project. The main work of the project will be conducted by this person.

Although the Botanic Garden belongs to the university, there is one person working in the Botanic Garden who is hired by the Fundación General of the Universidad de Alcalá (FGUA), this person will attend project meetings for Scientific Coordination.

The FGUA is making their resources available to the beneficiary (UAH) and the FGUA will be a third party type A) Third party making their resources available to the beneficiary.

FGUA will pay the travel costs and the UAH reimburses the FGUA these costs, the UAH will claim them as an eligible cost.
There is a prior agreement between the FGUA (The Third Party) and the UAH defining the frame of collaboration of both institutions concerning the Botanic Garden.

The UAH will reimburse to the FGUA
- travel costs of people attending meetings.

There won’t be any profit for the third party
B. 2.4. Resources to be committed

2.4.1. Overall Budget

INQUIRE has 36 month project duration and an overall budget of: € 2,234,024
It is divided in personnel costs, travel cost and other costs including conference fees, hosting working meetings and organizing the final conference. Money is shared between 17 participating partners in 11 European countries (see table p. 65).

2.4.2. Personnel Costs:

Total € 1,485,453

Non costed resources
Every organisation will bring in personal (eg. Scientists, Botanic Garden Staff, Botanic Garden Educator) financed by the organisation themselves.

Costed resources
Personnel costs are needed to support project partners to install and run Advisory Groups, develop and run the INQUIRE teacher training course, and conduct and support formative course assessment and practitioners' research. In addition personnel will be needed to organise nationwide botanic garden meetings, Natural History Museum and Science Centre meetings, analyze data, summarise and present results, participate in consortium meetings as well as for preparing papers, abstracts, oral presentations and posters for national and international meetings and the final conference. UNI Bremen is responsible for supervising summative and formative assessment of INQUIRE course development as well teachers and educators professional development. KCL will oversee reflective practice done by participating teachers and educators. LOtC Partners inform teachers and educators about how work is shared between these two partner institutions.

2.4.3. Travel Costs:

Total: € 190,300
To ensure the long-term sustainability of INQUIRE, partners are envisaged to promote the course to sites (botanic gardens, natural history museums, wetlands, etc) throughout their country. In years 2 & 3 of the project, educators from those sites will be invited to participate on their own costs in the training course. The tuition costs will be free of charge but the project will endeavour to support travel and subsistence costs. Partners may also travel to different regions of their country to make contact with site-based educators and present the benefits of the course to them and to teachers. With the help of the project website and the network, news about the course is expected to spread. Increasing numbers of site-based educators hopefully want to participate on their own costs in the network as they may see how effectively it meets the needs of teachers and students.
To establish a good working relationship between partners and to facilitate continuous working progress the consortium will meet on a regular basis
Working sessions will be held in participating countries to help participants get a better understanding of the uniqueness of selected countries.
In addition partners are envisaged to attend conferences to disseminate and promote INQUIRE project outcomes. At this stage we can only estimate the number of conferences people will travel to.

<table>
<thead>
<tr>
<th>Type of Travel</th>
<th>Number of people attending</th>
<th>Number of travel</th>
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</thead>
<tbody>
<tr>
<td>Travel to 4-5 Consortium meetings</td>
<td>LFU; BGCI 2 people&lt;br&gt;All partners 1 person (in case additional people will attend the meeting, partners will explain why) (stay two nights)</td>
<td>4 travels per Partner (=70) are envisaged</td>
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<tr>
<td>Travel to Final Conference</td>
<td>All partners are envisaged to attend the final conference. It is expected that more than 1 person per partner will participate (max. 3 people /partner including 1 teacher selected via the recognition scheme, In cas mor people will travel to the Conference partners will explain why) (stay two nights)</td>
<td>3 travels per partner (= 51)</td>
</tr>
<tr>
<td>Visiting partner institutions for Quality Management</td>
<td>KCL: 1 person will visit each LOtC site once in course of the three year project&lt;br&gt;Uni Bremen: 1 person may has to visit selected LOtC Institutions in case it will be necessary.</td>
<td>14&lt;br&gt;4 (we do not know that yet)</td>
</tr>
<tr>
<td>Travel to attend national conferences</td>
<td>Each partner is envisaged to attend conferences or topic related meetings on the national level to disseminate the INQUIRE idea at least once a year. It is envisaged that 1 person per partner will travel to these meetings (in case more people per partner will have to go, partners will explain why)</td>
<td>a minimum of 3 travels per partner are envisaged (= 51)</td>
</tr>
<tr>
<td>Travel to attend international Conferences</td>
<td>Each partner is envisaged to attend conferences or topic related meetings on the international level to disseminate the INQUIRE idea at least once a year (Dissemination plan will help to plan these visits efficiently so that not to many partners attend the same conference. It is envisaged that 1 person/partner will travel to these meetings (in case more people/partner will have to go, partners will explain why)</td>
<td>a minimum of 3 travels per partner are envisaged (= 51)</td>
</tr>
<tr>
<td>Travel to European Project conferences (eg. Fibonacci, Pathway, Profile, S-Team)</td>
<td>To link INQUIRE to currently running Science and Society Projects the project Coordinator (LFU) will attend public meetings and conferences organized in course of these projects</td>
<td>A minimum of 5 travels are envisaged</td>
</tr>
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</table>

Individual travel costs for meetings are calculated for each advisory group including advisory group members and occasionally invited guests.

14 teachers will be supported to participate in the final conference through the teacher recognition scheme. Each partner will cover travelling cost for at least one teacher selected to go to the conference.
266616- INQUIRE

Bus transfer costs for participating teachers’ classes coming to the garden etc. will be covered by partners when necessary

2.4.4. Other Costs:

Total: € 138,480

To attend international and national conferences and meetings to promote the INQUIRE project conference fees are included.

Expenses for running teacher training courses at the LOTC institutions (teaching material, copies for seminar papers and handouts, paper folders, jotting paper, flip charts and paper, CD-ROMS, snacks and drinks etc) are included.

Expenses for teaching material for working with participating teacher’s classes at the LOTC Institution (laboratory equipment to equip classes working at the LOTC institutions, handout copies, paper folders for children to collect handouts, teaching tools, paper in poster size and pens to do group work, seat cushions for children to do group work etc.)

Office supplies and copy cards needed for paperwork in course of the project (indirect cost are only 7% in this CSA).

Snacks and drinks for Advisory Group meetings or promotion events (small things, no catering service is needed)

Costs for organizing and conducting the Final Conference are listed separately (BGCI).

2.4.5. Management Costs

The budget dedicates € 134,397 personnel.

2.4.6. Subcontracting

The overall sum for Subcontracting will be: €148,990. It will be used for:

1. Publishing Project Outcomes

One goal of the Project is to promote and disseminate project outcomes in a common layout (corporate identity) to show that this project is a joint venture of 17 partners located in 11 European countries. Therefore it is planned to:

- design a logo and a graphic design for INQUIRE’s public appearance. This will include:
  - the website,
  - printed material (leaflets, banners, conference booklet, handouts, posters etc).
  - the layout for newly developed teaching material used in the course
  - the layout for the INQUIRE course manual that is published on the website
  - the layout for other documents published on the websites and the EU central information provider (see Deliverables including the External Report)

This also includes lay-outing and proof-reading of published reports.

Experience has shown that texts and pictures can be provided by partners but a graphic designer has to put them into the given layout because average people are not experienced in working with the particular computer programmes used. Personal costs for that are also summarized in this budget.

- Graphic design and layout of already existing teaching material used in the course will keep its appearance to make the reference to these projects visible but the INQUIRE logo will be added

BGCI and LFU is responsible for this

Budget: max 29,000€
2. Final Conference:

For the final conference an announcement folder (to be distributed at meetings and national and international conferences and sent to LOtC institutions) as well as a programme booklet will be printed and catering will be hired. Conference proceedings will be available online in English with abstracts included in 10 languages. Personnel cost for extra help during this event is included.

Budget: about € 21,400

3. Website development:

A website will be created and translated into 10 partner countries languages: BGCI will be responsible for this subcontracted additional help.

Budget: max: 35,000€

The budget for the website has been based on the following:

- Registration of website domain name for six years
- Cost of provider to host website
- Dedicated server
- Multi-functionality of website including 11 language areas with links, partner only area, facilities for social networking, archive area for images and e-newsletters, teacher forum, facility to receive payment for final conference, interactive map of partners, search function, facility for including video, facility to up and download project products (Inquire Course Manual, teaching material for INQUIRE courses, reports etc)
- Opportunity to register for the conference
- Training session within one of the consortium meetings for partners to upload information onto website.
- Additional personnel will be needed to upload all required data to set up the website. Partner BGCI will then be responsible for the day to day maintenance of the website

A selection process will be conducted to keep the price for this website as low as possible.

4. External Evaluation

We will invite three potential evaluators for offers.

Budget: about € 4000

5. Promotion

Budget: max 20,000

Various additional promotion activities (events, leaflets, posters, etc) should be organized in various participating countries. As we do not know yet who will do what and the management board is interested in coordinating and overseeing these activities so that this money will be spent deliberately (e.g. printing leaflets or banners or posters together to come up with a larger edition, pay for low budget catering informative meetings arranged for teachers, other LOtC institutions etc), we decided to set up a “promotion activity pool” and partners can apply for money to support their activities. It is estimated that each partner may spend about 1250€ for that.

6. Translation

While some partner have people working at their institution already or will employ people working in the project who are proficient in English (able to translate vice versa) others will subcontract offices to do this job. Costs for translation are also dedicated to translating already existing teaching materials. See Budget tables

The Translation Service of the UAH is also managed by the FGUA (the invoices of such service are from the FGUA), but there isn’t any prior agreement between the UAH and the FGUA concerning this
translation service, therefore the costs of this service cannot be reimbursed to the UAH since this agreement does not exists.

Budget: €39.590

Partners subcontracting translations:

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<tr>
<th></th>
<th>Royal Botanic Gardens Kew (KEW)</th>
<th>U.K</th>
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<tbody>
<tr>
<td>4</td>
<td>University of Bremen (UniHB)</td>
<td>Germany</td>
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<td>5</td>
<td>University of Sofia (UBG)</td>
<td>Bulgaria</td>
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<td>Schulbiologisches Zentrum Hannover (SBZH)</td>
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<td>Coimbra Botanic Garden (FCTUC)</td>
<td>Portugal</td>
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<td>10</td>
<td>Moscow State University Botanical Garden (MSU)</td>
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<tr>
<td>11</td>
<td>Natural History Museum, Botanical Garden (NHM)</td>
<td>Norway</td>
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<tr>
<td>12</td>
<td>Botanischer Garten, Rhododendron-Park, botanika Bremen (BGRHB)</td>
<td>Germany</td>
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<tr>
<td>13</td>
<td>Universidad de Alcala (UAH)</td>
<td>Spain</td>
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<td>14</td>
<td>University of Lisbon (UL)</td>
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<td>VIFS</td>
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<td>Travel Costs</td>
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B.3. Impact

B.3.1. Strategic impact

The European Union aims to be the most competitive and dynamic knowledge based economy of the world by 2010. The need to deliver abundant and well-trained human resources for European research has become a matter of increasing urgency and political commitment. Additionally we live in an age of constant scientific discovery. More and more scientific and technology issues dominate national and international discourses about environmental and economic threats such as climate change, biodiversity loss, gene technology, etc. Understanding these debates and learning about science has become as basic as reading and writing (R. M. Hazen 2002).  

The Pisa 2003 Assessment Framework – Mathematics, Reading, Science and Problem Solving Knowledge and Skills states that:

“Current thinking about the desired outcomes of science education for all citizen emphasises the development of a general understanding of important concepts and explanatory framework of science, of the methods by which science derives evidence to support claims for its knowledge and of the strength and limitations of science in the real world. It values the ability to apply this understanding to real situations involving science in which claims need to be assessed and decision made”.

PISA/OECD asks for “Scientific Literacy which is the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity (PISA/ OECD 2003”). The European Commission report: “Science Education now, A renewed Pedagogy for the Future of Europe” 2007 states that a “reversal of school science teaching pedagogy from mainly deductive to inquiry based methods provides the means to increase interest in science”. In addition this report also strengthens the opportunities IBSE provides for co-operations between actors in formal and informal arenas. This report highlights “teachers as key players in the renewal of science education” and asks for establishing networks which “allow them to improve the quality of their teaching and supports their motivation” (Rocard Report 2007).

Supporting international standards for good science education

INQUIRE supports and promotes these research defined education standards by developing a one-year IBSE based teacher training course, putting successful teaching techniques into practice and supporting teachers to evaluate their own progress by undertaking their own reflective practice at primary and lower secondary level. The emphasis of INQUIRE is, as Millar and Osborne (1998) put it,

-“not on how to do science. It is on how to create scientific knowledge, or to recall it briefly for a terminal examination … Thus in science, students should be asked to demonstrate a capacity to evaluate, to distinguish theories from observations and to assess the level of certainty ascribed to the claims advanced.”

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The final conference will contribute to education research focusing on scientific literacy. In addition, INQUIRE will endeavour to embed sustainable best practice and provide research based arguments demonstrating why it pays to spend time encouraging children to develop scientific thinking.

Information collected through the INQUIRE training courses, support groups, network and National Meeting reports, along with the research findings, will offer an excellent set of data that could feed into potential EU wide standards for the evaluation of formal and informal teacher training and education programmes. Evaluating science education programmes at Botanic Gardens and similar environmental organisations, as well as contributing to European wide classroom based research will result in a ‘Quality Management Plan’ (including best practice models) and will be available to the public via the INQUIRE web site.

**Counteract the OECD-wide declining interest in Science and Technology**

The OECD Policy Report\(^5\): Evolution of Student interest in Science and Technology Study outlines the necessity of improving science teaching and learning in particular because

> “educational content and curricula pays an important role in raising and maintaining young people’s interest in science and technology. Negative experiences at school due to uninteresting content or poor teaching are often very detrimental to future choice”.

Right now, many education institutions are facing a time of change. The Bologna Process is in the process of implementation and teacher training institutions are adjusting to meet this need. Due to budget reductions, numbers of science lessons are not only reduced within school curricula across much of Europe, but also in teacher training. In contrast, schools are longing for well trained professionals able to teach science in an inspiring way and to motivate young people to focus on science and technical education and careers. **Profound and inspiring continuous professional development of teacher is critical.**

INQUIRE will help teachers and informal science educators meet PISA/OECD expectations for good science education. It will also help them turn science lessons into exciting and engaging opportunities for learning about science. INQUIRE teacher Training courses, offered by participating botanic gardens and natural history museums, are envisaged to encourage teachers to improve their science teaching and to support their developmental progress through a supportive collaboration. Advisory Groups are envisaged to influence strategies for national science education standards for both primary and secondary school pupils and teachers.

**Address the need for better science education for teachers**

Inquiry based teaching and learning techniques are often said not to be applicable in every day school life, because teachers - especially at primary level - do not have 1) the confidence to teach science topics and 2) the equipment to use in class. INQUIRE’S informal education institutions will function as support organisations, and offer this equipment as well as background knowledge to get teachers started.

Wynne Harlen’s study in 1999\(^6\) shows that many teachers do not feel confident about their own science literacy and therefore avoid teaching science topics as far as possible. The analysis carried out with 144 teachers in the ‘PLÁSCIGARDEN Project’ demonstrated that primary school teachers avoid teaching plant related topics because of this lack of confidence. They blame it on their own weak science education whilst at school and during their teacher training.

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INQUIRE is envisaged to bolster the capability and confidence of teachers to deliver IBSE by offering background knowledge as well as sharing teaching experience via the INQUIRE website. Through this training INQUIRE envisages to enable increasing numbers of children to become scientifically literate citizens.

The interactive web site will offer ready-to-go teaching resources and will function as a platform for teachers all over the world to share experiences and best practice models as well as research outcomes.

**Enrich formal education by incorporating informal learning opportunities**

Cox Petersen (2003) has shown that in order to obtain the best learning results in informal settings pre- and post processing in school is needed. King's College London has been involved a five year project funded by the US National Science Foundation known as the Center for Informal Learning and Schools (CILS website, [http://qt.exploratorium.edu/cils/page.php?ID=23](http://qt.exploratorium.edu/cils/page.php?ID=23)). This project examined the links between science education in formal and informal contexts. CILS conducts research on informal learning, the informal science education infrastructure and the connections between in- and out-of-school science learning. CILS also provides training through graduate programmes in developmental psychology and science education, professional development for informal educators and conferences that bring together researchers and practitioners. CILS is a partnership of the Exploratorium, King's College London, and the University of California Santa Cruz.

Consortium member Prof. Dr. Justin Dillon, who is also member of CILS, will link INQUIRE to CILS. INQUIRE will builds on CILS.. INQUIRE will pool resources from the formal and informal learning sectors to contribute new findings. By supporting INQUIRE course participants to evaluate their own teaching while practicing IBSE techniques in their own classes, highly interesting data will be gathered through classroom based research. INQUIRE will seek to motivate a huge number of educators (formal and informal) to put theory into practice.

**INQUIRE provides strong curriculum based support for teachers to give IBSE a try**

Analysis in four European countries has shown that at least in Austria, Italy and the UK primary school curricula does not need to be changed to introduce inquiry and context based teaching and learning methods. What teachers need is to be convinced of the benefits to children of teaching scientific topics and working with inquiry and context based techniques. The reason for their reluctance to embrace this teaching is, firstly curricula are crowded with topics that need to be covered within one school year. Consequently, teachers need to focus on selected topics and tend to stick with those they feel most confident with. As many do not feel confident with science topics they avoid them. Secondly when teachers want to carry out science in class they often face unequipped facilities and no space and material to work with. Teachers require on-going training to fulfil modern science education requirements.

INQUIRE will fight the lack of confidence by supporting teachers through informal education institutions. Teaching and learning materials as well as the equipment needed will be provided as well as teacher training in 11 European countries.

The INQUIRE web site will provides links to various ISBE based EU projects and will offer best practice resources adapted to the subject content ‘Biodiversity and Climate Change’ that INQUIRE teacher training courses are focusing on. Resources will be translated into 10

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European languages. Best practice models to motivate teachers all over the world to re-evaluate and adapt their science teaching to encompass more inquiry based teaching will be showcased on this website too. Teachers will then accommodate this style of teaching within the curriculum requirements.

The impacts of outdoor learning

Offering field work, and opportunities to work in the school grounds through INQUIRE teacher training activities has a number of impacts on student learning. As Mark Rickinson et al\(^8\) (2004) put it:

“Fieldwork can have a positive impact on long-term memory due to the memorable nature of the fieldwork setting...it can lead to individual growth and improvements in social skills. More importantly, there can be reinforcement between the affective and the cognitive, with each influencing the other and providing a bridge to higher order learning. ..... There is significant evidence that social development and greater community involvement can result from engagement in school grounds projects. Students develop more positive relationships with each other, with their teachers and with the wider community through participating in school grounds improvements”.

The UK government has introduced a new educational Manifesto ‘Learning Outside the Classroom’ which acknowledges the wealth of research on the impact and benefits on children’s learning using ‘out of classroom’ approaches. (Learning outside the Classroom – Manifesto 2007 \(^9\)). This is now being adopted widely across the UK and, no doubt, heralds a similar move in other parts of Europe. Botanic Gardens themselves are now becoming aware of the impacts of their own educational offer. Many gardens worldwide have either set up, or are participating in research programmes to explore the impact of the informal setting on formal learning processes. For a selection of research papers please see Appendix 2

INQUIRE will pool resources from the formal and informal learning sectors to improve access.

Hands on' educator training is a vital task to support IBSE for a renewed pedagogy in science in Europe

Focusing simply on technical competence can make teacher development narrow and utilitarian and there is evidence that traditional forms of professional development are not effective in creating improvements in children learning. If INQUIRE is to change fundamental learning goals it will also need to change teaching goals and probably the whole school ‘ecosystem’; its ethos, work with parents and links with the wider community including botanic gardens (J Osborne and J.Dillon 2008\(^10\)).

Many important kinds of scientific enquiry are absent from a teacher’s repertoire. For IBSE to be included and taught effectively in schools, a change process will be essential in many schools. In some instances the change will be drastic and CPD that is effective and supportive will be an essential part of this process. Tripp’s (1994) work on critical incidents in teachers’ practice indicates that the environment in which teachers work affects their practice and must not be ignored.

This aspect of teacher change is particularly relevant to the INQUIRE project. Where barriers exist, a botanic garden, Natural History Museum or a Science centre can be a bridge to

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\(^8\) Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M.Y., Sanders,D., Benefield,P.,(2004), A Review of Research on Outdoor Learning, National Foundation for Educational Research,

\(^9\) Dillon, J. (Jan 5 2007) ‘The "Learning Outside the Classroom" Manifesto Wildlife Network
http://www.teachernet.gov.uk/teachingandlearning/resourcematerials/outsideclassroom/

\(^10\) Osborne J. and Dillon J., (2008), Science education in Europe: Critical Reflections, A report to the Nuffield Foundation, King’s College London, UK
enhancing IBSE in general and plant science in particular, because each Institution offers a huge range of resources with which teachers and children can engage. Analysis in the PLASCIGARDEN Project has shown that new teaching methods are more likely to be adopted when educators have the opportunity to attend training seminars and try them out in a safe surrounding. Access to a website alone is not sufficient to change teaching habits. CPD training courses that are of a longer duration than single seminars and contain reflective practice are regarded to be more successful in changing deadlocked teaching habits. In addition easy-to-use teaching resources offered in various European languages will motivate many thousands of teachers and schools to initiate IBSE. INQUIRE teacher training courses will be held in Botanic Gardens because these informal learning sites are more likely to attract teachers’ interest in participating. These courses will INQUIRE not only those but many more teachers to investigate and try IBSE teaching resources themselves.

About 28 one-year long INQUIRE training courses will be offered to interested teachers by botanic gardens in 11 European countries. These training courses will not only support those teachers actively participating but will facilitate a ‘cascade’ training system that will draw in other teachers, as well as local, regional and national teacher training centres and networks. As an example, teachers in Austria became so excited about IBSE teaching that they now offer teacher training seminars in their own schools (these courses are called SCHILF-training in Austria: schools internal teacher training). Experience has shown that these training seminars are very likely to attract teachers (see ANNEX 1: Dissemination report of PLASCIGARDEN project).

Influential networks will be linked

In a recent Editorial published in the SCIENCE Journal (Oct. 23. 2009), Pierre Lena mentioned the Fibonacci project which will run in 21 European countries between 2010 - 2012. The S-TEAM project and various others are on the way already or will be starting soon. Most of these projects are coordinated by and/or bring together many ESERA (European Science Education Research Association) members. The INPSIRE Management Board member Justin Dillon, current President of the ESERA, will intend and establish good collaboration between INQUIRE and other IBSE education projects. The goal is to inform each other about projects progress, preliminary and final results as well as learn from each other while work is in progress. This will support all collaborators to gain the best of results. The EU information provider will support this collaboration.

All INQUIRE partners are active members in various research and education networks like BGCI, EBGEN, BGEN, ECSITE, PLANTNETWORK, GEM, Science Centre Network Austria, various National Botanic Gardens and Natural History Museum Networks, Science education Research Networks such as ESERA and CLS etc. Promoting IBSE through these networks will have a crucial impact on informal learning as well as on learning at the interface between the formal and informal sectors across Europe. On the other hand schools all over Europe will learn about best practice models through school partnerships and school websites as well as botanic garden and school authorities’ websites and the public media. Many more schools will seek partnerships between informal education institutions and schools in general.

Thousands of primary and low secondary school children take part in a European wide IBSE pilot study

In the first year of running the INQUIRE pilot course, 14 Partners in 11 European countries envisage to train approximately 210 primary and lower secondary teachers and 70 informal educators In the second year Partners will train a further 210 teachers and 70 educators. This number is likely to increase substantially as other informal institutions in each of the Partner countries run their own courses on their own costs. Teachers will work with inquiry
and context base teaching techniques in schools and at botanic gardens and natural history museums and will experience how exciting and fascinating science learning can be. Their learning outcomes will be evaluated through scientifically guided reflective teachers practice - which will consider whether or not pupils change their attitudes towards science learning, develop scientific understanding through observing, thinking, experimenting and validating, gain more confidence in designing their own experiments and develop their cognitive, conceptual, social and epistemological skills. In the first year of running the INQUIRE training course, the 14 Partners envisage to directly reach more than 10 000 children. If two informal institutions in each Partner country also run the INQUIRE training course on their own costs.

**A strong professional model for educators is created**

Over 550 teachers and informal educators will participate in practitioner’s research which will direct them to reflect on their own teaching practice and gain an insight into science education research. The use of practitioner research is increasingly advocated as a self-reflective tool that can support the development of teachers and science educators (K.S.Taber 2007\(^1\)). Currently very few informal learning institutions investigate or utilise strategies that will more effectively enable them to evaluate their education programmes. The INQUIRE project will design a model for evaluating teaching techniques that link education research to practitioner’s research in a formal and informal setting. A Quality Management Plan will be created and uploaded onto the INQUIRE web site. Informal science education institutions, school teachers and interested parties will be able to access the homepage and download the ‘research handbook’ free of charge. They will become members of the research community themselves. Presentations of outcomes at international and national science education meetings and conference will inform the science education research community of the practitioners’ points of views. This will also provide a forum for practitioners to gain an insight into formal science education research.

**Key players will make changes happen**

As mentioned above, more than 550 teachers and educators will be involved in this project and Advisory Groups will act as multipliers to disseminate INQUIRE goals on a regional basis. Experience already gained in the PLASCIGARDEN project and in other IBSE EU Projects has demonstrated that as soon as national school boards and formal lower and higher education institutions are involved in projects such as these, they are very supportive and encourage the incorporation of IBSE techniques at schools and in teacher training. At Innsbruck University an outcome of the PLASCIGARDEN project is a new lecture focusing on inquiry based learning within the revised curriculum for biology teachers. The ‘Pädagogische Hochschule’ which is responsible for training teachers at primary and secondary school level, included the ‘How do plants live’ module within their training programme. In Bulgaria a co-operation between the Ministry of Education and Science and the Botanic Garden has been developed to support the implementation of a revised syllabus which includes IBSE teaching methods. In Italy MTSN has established a very supportive Advisory Group with more than 10 teachers coming together to discuss and evaluate the materials. INQUIRE will build on these successful developments and will disseminate the ideas throughout 11 European countries. KCL is currently involved in developing the U.K. National Curriculum and will support participating countries with their knowledge and expertise.

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\(^1\) Taber K.S. (2007), Classroom-based Research and Evidence-based Practice, SAGE Publications Los Angeles, London, New Delhi, Singapore
Advisory Groups will enable a two-way flow of information between key decision makers and practitioners as well as the research community and facilitate a better understanding of each others working contexts and outcomes. The IBSE Expert Consortium will link Advisory Groups at an international level. National and international meetings, scientific and public publications, leaflets and the INQUIRE website will all support this network. The final report will show a comprehensive list of activities carried out by a range of Partners to address this goal, emphasising the fact that a renewal of science pedagogy in Europe can only take place when all key players work collaboratively to reach given goals.

**Supporting education for a sustainable Europe**

The need for IBSE in general and learning about ‘Climate change and Biodiversity’ in particular has never been so pressing. Every day alarming reports are published about the strain our environment is under. For example, global average temperatures have risen by on average 0.74°C over the past century (1906 to 2006) with the warming rate for the last 50 years nearly twice that of the last 100 years (IPCC AR4, 2007). Arid and semi-arid regions such as the Sahel, the Mediterranean and south Asia are becoming drier and in Africa’s large catchment basins of Niger, Lake Chad and Senegal, total available water has decreased by 40-60% (UNFCCC, 2007) with prolonged droughts predicted to increase across the region (Fischlin, 2007). The reasons are complex, but it is clear that the underlying causes are human induced. INQUIRE focuses on education for sustainable living by addressing both the 1992 Earth Summits goals and the Millennium Development goals. At the 1992 Earth Summit in Rio de Janeiro, world leaders agreed on a blueprint for ‘sustainable development’ - meeting our needs while ensuring that we leave a healthy and viable world for future generations. One of the key agreements adopted at Rio was the Convention on Biological Diversity. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

*Since the signing of the Convention on Biological Diversity, biodiversity has become an important theme in science and society. Both the science education and the environmental education community are looking for ways to incorporate learning about (mostly science education) and learning for biodiversity (mostly environmental education) into their teaching and learning activities in both formal (mostly science education) and non-formal (mostly environmental education) education…*

The INQUIRE training courses include topics such as plant diversity and the role plants play in the network of life, how plants can be protected and what role Botanic Gardens or Natural History Museums can play in conserving biodiversity. IBSE resources already published by PLASCIGARDENS address the issue of food production and transport, while resources produced by BGCI address the issue of plants and climate change.

IBSE provides children with the critical thinking skills, social skills, motivation and knowledge to contribute to and tackle issues concerning sustainable development. Controversial issues require an understanding of aspects of science: for example, deciding on the issues relevant to huge areas of tropical rainforest being uprooted to make way for agriculture or criteria for building roads through ancient woodland. Understanding the basic concept of photosynthesis, developed in PLASCIGARDEN topic ‘Experiments with Plant Growth’ or ‘Conservation’ (www.plantscafe.net) is crucial for weighing scientific evidence given in the

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14 CBD- Secretary of the convention on Biological Diversity 2001-2004 United Nations Environmental Program.

15 Source: BGCI on-line http://www.bgci.org.uk/education/biodiversity_bridge.html
media. This plays an important role in resolving problems and underpins decision making. Understanding how to collect and use scientific evidence about plants in particular, is an essential part of current and future education of those who will become active members of a democratic society. At a more practical level, understanding scientific enquiry is essential for those children who will study and use science in their future careers.

INQUIRE is one component in this mosaic of educational work to build a sustainable Europe. Inquiry-centred learning in class and in natural environments, such as Botanic Gardens, offer real experiences and bring children closer to the world of natural science. This way of learning will connect children to nature and empower them to become more informed and critically involved with their environment. See Justin Dillon (2006).16

**B.3.2. Spreading excellence, exploiting results, disseminating knowledge**

**B.3.2.1. Dissemination officer**

By the end of Month 3 the IBSE Expert Consortium (see Management structure and procedures p.41), will come up with a detailed strategy for where and how to disseminate preliminary and final results. The dissemination management will be based at BGCI and will be responsible for conducting the work agreed by the IBSE Expert Consortium. S/he will be hired through an open recruitment process carried out by BGCI. S/he will adapt this to newly emerging situations during the course of the project. The DO will present the dissemination strategy at the First Meeting (Month 4) and will ensure that it is continuously updated. Each participating country will also supplement this with their national activities.

In addition the DO will be responsible for:

- collating a list of relevant international and regional congresses and meetings and distributing this to Partners for their input
- encouraging Partners to participate in national events
- maintaining a database of meetings attended to track promotion of the project
- publishing three e-newsletters per year to inform target groups (teachers, education researchers, curriculum developers) about the project. E-newsletters will be prepared in English, translated into the language of each participating country and distributed
- updating the INQUIRE homepage with newly gained research outcomes, best practice models, etc
- publishing leaflets to promote INQUIRE to botanic gardens, informal science education institutions, national school boards, teacher training centres and the public in Europe and worldwide
- increasing the profile of the INQUIRE website through developing links with other relevant websites
- increasing the profile of the INQUIRE website to participating practitioners to exchange knowledge and experience while participating in INQUIRE training courses.
- supporting participants to present the progress and outcomes of INQUIRE at meetings and conferences (eg. BGCI’s 8th International Congress on Education in Botanic Gardens in Mexico 2012, World Botanic Gardens Congress in 2013, Eurogard VI in 2011, World Environmental Education Congress in Brisbane, Australia in 2011)
- preparing a minimum of two press releases per year about the project and disseminating them to the media

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• coordinating translations that will enable Partners to adapt and send them to their public media (local newspapers, magazines, broadcasting/radio) to promote the INQUIRE project
• supporting partners to and submitting papers on INQUIRE to relevant international journals (The Journal of Environmental Education, International Journal for Science Education, Roots, BGCI’s Education Review, Applied Environmental Education and Communication, Environmental Education Research, etc.)
• organising the final Conference (about 150 participants) of the project in one of the participating countries in month 32
• preparing a CDRom of conference papers and sending to participants, project members as well as educational institutions and school boards etc. Uploading the papers onto the INQUIRE website
• searching for and collecting research papers and best practice models that address IBSE. This will be carried out in collaboration with QM and PC. Data will be included on the INQUIRE homepage directing visitors to a ‘further reading section’.

B.3.2.2. Promotion of outcomes

○ Internal promotion

Every Advisory Group (AG) will consist of a combination of primary and secondary school teachers, a head teacher, local authority advisors (UK), the school board (UK governors), curriculum planners, botanic garden educators etc. Members of each group will be committed to disseminating and using the outcomes in their professional capacity within their institutions as well as in Europe and worldwide

○ External promotion

Worldwide promotion of the results will be considered at a meeting of the IBSE Expert Consortium. It will involve publication, web publication (homepage), presentations at national and international congresses, conferences and meetings and presentations via national and international public media. The IBSE Expert Consortium will agree on which results and information will be put forward via the media. Public relations will be carried out on a regional basis by each AG.

B.3.2.3. Tools and mean to be used to disseminate the results

○ During the first year of the project dissemination of information concerning the project will be limited to the distribution among the project partners and the EU commission project officer.

○ During the second and third year of the project the purpose of dissemination will be to raise awareness about INQUIRE principally through formal and informal education channels. A budget is identified for dissemination of the results to extended audiences in Europe and worldwide (e.g. Dissemination officer). Activities will include:
  • publishing the project abstract in plant education and educational journals (e.g. BGCI’s Roots, Environmental Education Research, Applied Environmental Education and Communication)
  • publishing on the INQUIRE web site
  • publishing best practice and project outcomes through the EU central information provider. At the end of the project the ‘Quality Management Report and Conference Proceedings’ will be available
  • preparing abstracts, posters and oral presentations for international meetings (a strategy will be prepared by the DO by the end of WP1)
disseminating press releases to the public media such as local newspapers, magazines, television etc. Each NG is responsible for contacting their local and national media
• distributing leaflets about INQUIRE training courses locally and internationally (BGCI has agreed to include leaflets in their international mailing). NGs will distribute leaflets at national meetings.
• Preparing a display at the Final Conference

All Partners will be involved in the promotion of INQUIRE on a national basis and, according to their roles, on an international basis.

B.3.2.4. Community building on the international level

This will be supported through presenting papers and posters at international conferences throughout the whole project duration such as BGCI’s International Congress on Education in Botanic Gardens (Mexico 2012), American Public Gardens Association Annual Conference (Philadelphia, 2011), ECSITE conference Warsaw, Poland May 2011, European Association of Zoos and Aquaria (Innsbruck, 2011), European Science Education Research Association (ESERA, Lyon, France, 2011), etc.

The INQUIRE website will also be promoted to networks of LoTC institutions worldwide (eg. botanic gardens (BGCI, BGEN), zoos (WAZA, EAZA), wetland centres (WLI), Field Study Centres (FSC), RSPB sites, natural history museums, science centres (ECSITE), environmental education networks (eg. Australian Association of Environmental Education (AAEE), Environmental Education Association of Southern Africa (EEASA).

Project partners will make their training sessions available to potential associate partners (or ‘friends of INQUIRE’) who may send a representative (at their own cost) to training sessions (open and free Train the Trainer courses). This will support LoTC community building on a national and international basis.

B.3.2.5. Final Conference

We envisage that the Final Conference will include representatives from all Partner countries. It will be held in a Partner country and will be organized by BGCI. Participants will indicatively consist of informal educators, science education researchers, researchers in informal education as well as in formal education, teachers and decision makers in curriculum development. (see p.30)

The conference will be announced a year in advance and details will be posted on the INQUIRE homepage and promoted through all Partner networks. The main language of the conference will be in English, although every effort will be made to include translations of Partner languages. The conference will provide an important platform for participants to present their indicative findings to a peer group as well as to academics. It will also offer a forum for practitioners and academics to gain a better understanding of each others work. This two-way dialogue should help raise standards in IBSE and promote more relevant research.
4. Ethical Issues: Yes

Work package 9 has been dedicated to Ethical Issues and comprised a detailed description of work carried out to meet given requirements.

"The progress of compliance with the Requirements will be described in the periodic/final Reports under the Section 3.2.2 ('Work progress and achievements during the period')

**ETHICAL ISSUES TABLE**

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<tr>
<td>Does the proposal involve patients or persons not able to give consent?</td>
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<td>Does the proposal involve adult healthy volunteers?</td>
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<td>Are those animals non-human primates?</td>
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<td>Benefit to local community (capacity building ie access to healthcare, education etc)</td>
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I CONFIRM that the proposal comply with the relevant ethics-related EC/international legislation

YES

The consortium members agree to carry out this project in accordance with Data Protection Regulations and will comply with Directive 95/46/EC to ensure correct handling of data and privacy.

During the course of this project, consortium members will take all the necessary steps to ensure that all participants; teachers and students, understand the objectives of this project and the processes employed during Inquire to achieve them. All beneficiaries will follow local and national regulations regarding data protection and will obtain approval from local/national authority in charge of data protection if applicable.

The proposers will provide the Commission a written confirmation that it has received favorable opinions of the relevant ethics committees and if applicable, the regulatory approvals of the competent national or local authorities in the country in which the research is to be carried out. Copies of the official approvals from the relevant national or local ethics committees will be provided to the EC prior to the start of the respective research.
ANNEX 1: LITERATURE


International Council for Science (2002), ICSU Series on Science for Sustainable Development, No. 5: Science Education and Capacity Building for Sustainable Development. 31 pp


J. Osborne and J. Dillon, 2008, Science education in Europe: Critical Reflections, A report to the Nuffield Foundation, King’s College London, UK


Sjøbeg, S., & Schreiner, C. (2005). How do learners in different cultures relate to science and technology? Results and perspectives from the project ROSE. Asia Pacific Forum on Science Learning and Teaching, 6(2), 1-16.


ANNEX 2: Selection of Research papers regarding learning outdoors / botanic gardens and education


A Review of Research on Outdoor Learning (Field Studies Council, 2004 with Justin Dillon, Kelly Teamey, Marian Morris, Mee Young Choi, Dawn Sanders & Pauline Benefield)

Improving the Understanding of Food, Farming and Land Management Amongst School-age Children: A Literature Review. (DfES, 2003 with Justin Dillon, Dawn Sanders, Kelly Teamey & Pauline Benefield)


Improving the Understanding of Food, Farming and Land Management Amongst School-age Children: A Literature Review. (DfES, 2003 with Justin Dillon, Dawn Sanders, Kelly Teamey & Pauline Benefield)