The Fibonacci Project

DISSEMINATING INQUIRY-BASED SCIENCE AND MATHEMATICS EDUCATION IN EUROPE

FIBONACCI EUROPEAN TRAINING SESSION

DEEPENING THE UNDERSTANDING OF INQUIRY IN NATURAL SCIENCES

Wednesday, March 21st to Friday, March 23rd, 2012

International Centre for Pedagogical Studies (CIEP), Sèvres, France

WITH THE SUPPORT OF

EUROPEAN COMMISSION

SEVENTH FRAMEWORK PROGRAMME

What is the Fibonacci Project

Funded by the European Union under the 7th Framework Programme and supervised by a high level scientific committee, the Fibonacci Project (2010-2013) aims at a large dissemination of Inquiry-Based Science and Mathematics Education (IBSME) throughout the European Union, in a way that fits with national or local specificities. This project defines a dissemination process from 12 Reference Centres to 24 Twin Centres based on quality and a global approach. The Fibonacci Project will lead to the blueprint of a transfer methodology valid for building other Reference Centres in Europe.

The Fibonacci project is based on 3 pillars:

1. **An inquiry-based approach** to science and mathematics teaching and learning in primary and secondary schools;
2. **A local approach,** mobilising a comprehensive and complementary group of local partners.
3. **A twinning strategy** linking 37 centres in 24 countries. From 2010 to 2012, 12 Reference Centres with a high expertise in IBSME are twinned with 12 intermediate centres and 13 beginner centres. In 2012, 24 new partners will join the Fibonacci project, expanding it to almost all European countries.

See <www.fibonacci-project.eu> for details.

Fibonacci European Training Session

DEEPENING THE UNDERSTANDING OF INQUIRY IN NATURAL SCIENCES

The Fibonacci European Training Session *Deepening the Understanding of Inquiry in Natural Sciences* is the last of a series of five European Training Sessions organized in the frame of the Fibonacci Project as a result of the work and exchanges among Fibonacci partners. This Training Session has been conceived by taking into account the expertise of all Fibonacci centres involved in its planning and will enable participants to exchange experiences and to converge towards common approaches and methodologies.

Main Aim

To better define inquiry-based science teaching by exploring teaching and learning practices, and to disseminate strategies for its implementation and tools for evaluation of practice and the consideration of student assessment.

Specific Objectives

- To better define IBSE (Inquiry-Based Science Education) by exploring teaching and learning practices;
- to explore similarities and differences between IBSE practice at kindergarten, primary, and middle school levels;
- to understand the issues at stake at the different stages of implementation of an IBSE project;
- to explore teacher training and support activities;
- to discuss evaluation of teacher Continuing Professional Development (CPD) in IBSE;
- to share strategies for formative and summative assessment of student learning in IBSE.

Rationale

Throughout this training session, participants will be asked to reflect upon how IBSE translates into observable classroom practices. This should allow participants to:

- develop a better understanding of IBSE;
- identify the components of IBSE that must be adapted to their national contexts, from those which can be shared by all;
- engage a back-and-forth dialogue between theory concerning best practices on IBSE and classroom practice in context;
- provide teachers and teacher trainers with the means to assess their own practices;
- build a basis for communicating the essence of good quality science education to parents, the public and others concerned with education.

Our topic group is concerned with proposing to seminar participants a space for productive dialogue between research on science education and practice. To ensure this dialogue, Dr. Wynne Harlen, a leading expert in primary school science teaching and a member of the Fibonacci Scientific Committee, closely advised the group in the conception of the seminar and will contribute to its development.

Venue

The Seminar will be held at the International Centre of Pedagogical Studies (CIEP), located in Sèvres, very near Paris, connected to the city by metro and tram. The Centre includes single bedrooms, a dining room, a Conference Hall, and 15 Seminar Rooms.
Accommodation at the CIEP in an individual room is 39,50 Euros per night (including breakfast); lunch and dinner are 17 Euros each.
More details can be found at:
<www.ciep.fr/en/index.php>

Any questions?

Susana Borda Carulla
ENS, Paris: Fibonacci TG2 Coordination
La main à la pâte Foundation
1, rue Maurice Arnoux
92120 Montrouge, France
E-mail: susana.borda@fondation-lamap.org
Phone: +33(0)1 58 07 65 94

Timeline

WEDNESDAY, March 21st

OPENING

9.00 – 9.45 Plenary session
- **Welcome words.** *Christian Amatore* (*La main à la pâte*, French Academy of Sciences)
- **The Fibonacci Project**. *David JASMIN*
- **The Fibonacci European Training Session: *Deepening the Understanding of Inquiry in Natural Sciences***. *Susana BORDA*

9.45 – 10.00 Coffee break

SESSION 1: WHAT IS IBSE?

10.00 – 12.30 Practical workshop: 3 groups
- **1.1 What does inquiry feel like? An inquiry-based learning experience**
  G1: Frédéric Pérez
  G2: Gabrielle Zimmermann
  G3: David Wilgenbus

12.30 – 14.00 Lunch at the CIEP

14.00 – 15.30 Plenary session
- **1.2 IBSE and how children learn**
  Wynne Harlen
- **1.3 Introduction to the Diagnostic Tool for CPD providers**
  Wynne Harlen, Susana Borda

15.30 – 16.00 Coffee break

16.00 – 18.00 Practical workshop: 3 groups
- **1.4 Preparing to observe IBSE**
  G1 (kindergarten): Marida Ergazaki and Clémentine Transetti
  G2 (primary school): Susana Borda and Jan Schoultz
  G3 (middle school): Kristina Zoldosova and Anna Pascucci

18.15 – 19.15 Poster session.

19.30 Tasting of specialties brought by participants.

THURSDAY, March 22nd

SESSION 1: WHAT IS IBSE?

7.30 Departure from CIEP to class visits

9.00 – 11.30 Class visits: 12 groups
- *G1: kindergarten*
- *G2: primary school*
- *G3: middle school*

11.30 – 12.30 Return to CIEP

12.30 – 14.00 Lunch at the CIEP

14.00 – 15.30 Practical workshop: 3 groups
- **1.6 Analyzing the class visits: inquiry at the different levels of schooling**
  G1 (kindergarten): Marida Ergazaki and Clémentine Transetti
  G2 (primary school): Susana Borda and Jan Schoultz
  G3 (middle school): Kristina Zoldosova and Anna Pascucci

15.30 – 16.15 Plenary session
- **1.7 Sharing results of class observations**
  Chair: Wynne Harlen

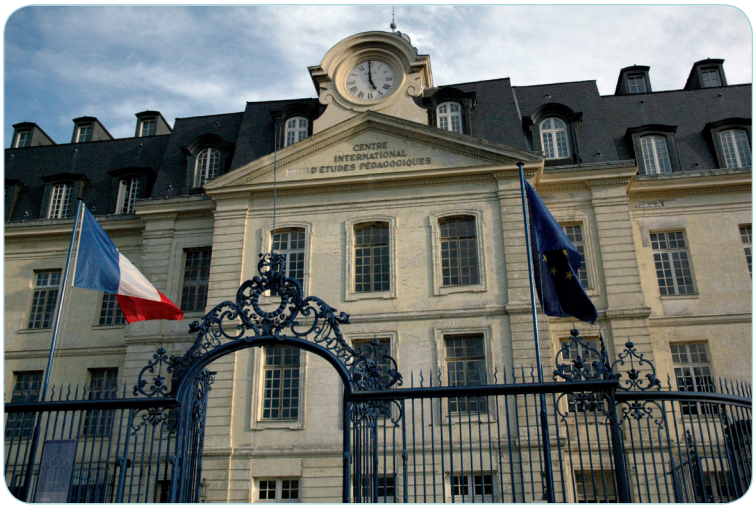
16.15 – 16.30 Coffee break

SESSION 2: IMPLEMENTING IBSE

16.30 – 18.00 Plenary session
- **2.1 Systemic approach to IBSE implementation**
  Patricia Corieri, Anna Pascucci, Kristina Zoldosova

18.15 Departure from CIEP to CNAM (Conservatoire National des Arts et Métiers) for guided visit.

21.15 Return to CIEP



TUESDAY, March 20th

Afternoon: Arrival and check-in of participants

SATURDAY, March 24th

Morning: Departure of participants

FRIDAY, March 23rd

SESSION 2: IMPLEMENTING IBSE

8.30 – 10.30 Parallel practical workshops
- **2.2.1 Video and hands-on activities as tools for training**
  Frédéric Pérez
- **2.2.2 Mentoring science teachers**
  Clémentine Transetti, David Jasmin, Katarina Kotulakova
- **2.2.3 Promoting creative cross-curricular work for primary science teachers**
  Tina Jarvis

10.30 – 11.00 Coffee break

11.00 – 12.30 Plenary session
- **2.3 IBSE Self-Reflection Tool for Teachers**
  Wynne Harlen, Susana Borda
- **2.4 Designing an in-service programme to develop IBSE taking account of research findings**
  Tina Jarvis

12.30 – 14.00 Lunch

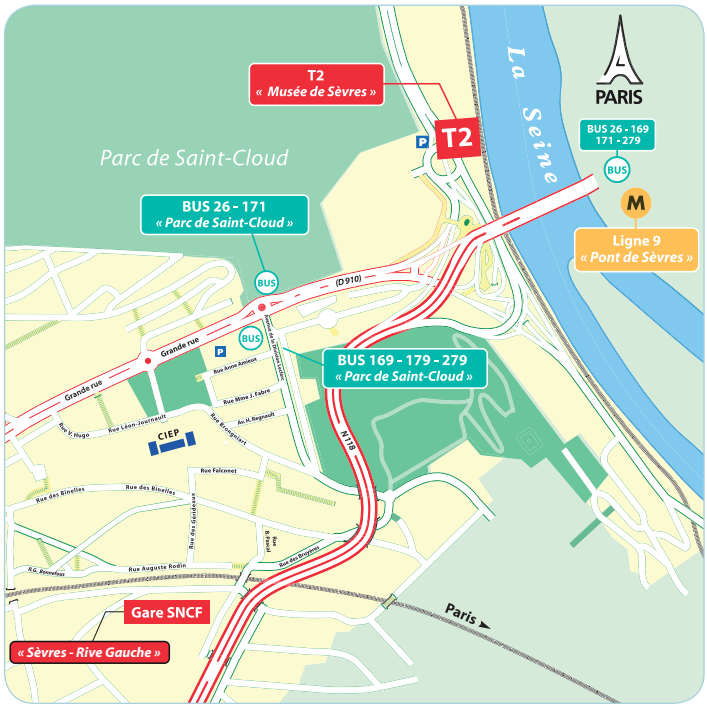
SESSION 3: ASSESSING STUDENT LEARNING IN IBSE

14.00 – 14.30 Plenary session
- **3.1 Assessment for formative and summative purposes**
  Wynne Harlen

14.30 – 16.30 Parallel practical workshops
- **3.2.1 Using students' work for formative assessment**
  Frédéric Pérez
- **3.2.2 Using teachers' judgements for summative assessment**
  Jan Schoultz

16.30 – 17.00 Coffee break

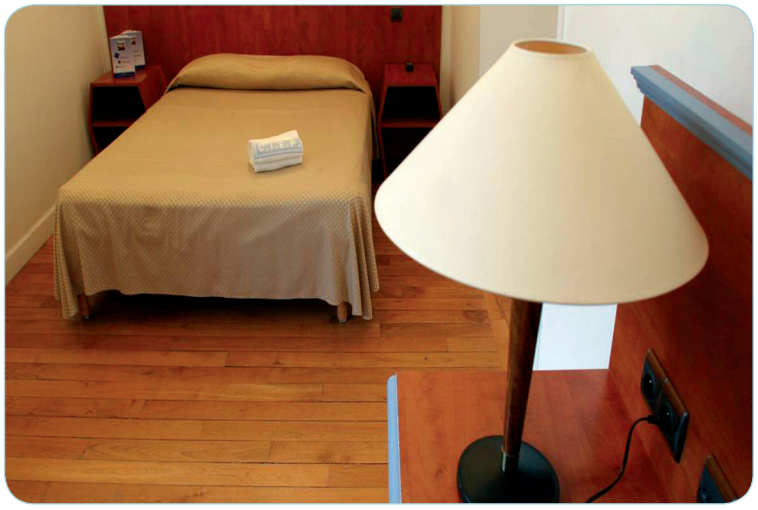
17.00 – 18.00 Plenary session
- **Evaluation, conclusions, and closure of the seminar**



International Centre for Pedagogical Studies

1, avenue Léon Journault
F-92318 Sèvres cedex

Phone: 33 (0)1 45 07 60 00
Fax: 33 (0)1 45 07 60 01
E-mail: <www.ciep.fr/contact/>
Web Site: <www.ciep.fr>



Description of the Workshops

Session 1: What is IBSE?

1.1 What does inquiry feel like? An inquiry-based learning experience

Frédéric Pérez, Gabrielle Zimmermann, David Wilgenbus

Participants will take part in a challenging inquiry-based learning experience adapted to adults and reflect on its implications for teaching and learning science in school.

1.2 IBSE and how children learn

Wynne Harlen

Participants will reflect on how IBSE is underpinned by theories of learning.

1.3 Introduction to the Diagnostic Tool for CPD providers

Wynne Harlen, Susana Borda

Participants will be introduced to an IBSE diagnostic tool which provides a list of criteria for judging the implementation of IBSE by observing and analyzing classroom practices. Its purpose is to identify the aspects of IBSE that are being well implemented and those where attention is needed. The instrument is meant to be used to evaluate Continuing Professional Development actions and thus give feedback to the providers concerning training priorities.

1.4 Preparing to observe IBSE

Marida Ergazaki, Clémentine Transetti, Susana Borda, Jan Schoultz, Kristina Zoldosova, Anna Pascucci

Participants will prepare the following day's class visits by using the Fibonacci IBSE Evaluation Instrument to observe video-recorded science lessons.

1.5 Observing inquiry inside the classroom

Participants will observe science and technology sessions (either in kindergarten, primary or middle school) and use the Fibonacci IBSE Evaluation Instrument to record their observations. They will meet with teachers to discuss class activities and professional development.

1.6 Analyzing the class visits: inquiry at the different levels of schooling

Marida Ergazaki, Clémentine Transetti, Susana Borda, Jan Schoultz, Kristina Zoldosova, Anna Pascucci

Participative analysis of the class visits. Participants will be divided in three groups, according to the school-level at which they observed the science lesson: kindergarten, primary, or middle school. They will reflect on the specificities on inquiry-based science learning at each particular level of schooling.

1.7 Sharing results of class observations

Wynne Harlen

The three groups will come together to share their respective conclusions and identify similarities and differences among IBSE in kindergarten, primary and secondary school levels.

Session 2: Implementing IBSE

2.1 Systemic approach to IBSE implementation

Patricia Corieri, Anna Pascucci, Kristina Zoldosova

How to start an IBSE project? How to reinforce it at its different stages and dimensions of development (resources, teacher CPD, mobilization of deciders)? Three testimonies will allow participants to identify the key issues at stake at the different stages of implementation of an IBSE project.

2.2.1 Video and hands-on activities as tools for training

Frédéric Pérez

Participants will experience and reflect on the advantages and disadvantages of two different teacher training strategies.

2.2.2 Mentoring science teachers

Clémentine Transetti, David Jasmin, Katarina Kotulakova

Examples of in-class scientific support delivered by science students and pedagogical peer support delivered by peers will be exposed. Participants will reflect on the pros and cons of each modality.

2.2.3 Promoting creative cross-curricular work for primary science teachers

Tina Jarvis

Inquiry can be enhanced though careful links with other subjects such as literacy, history, geography, sport and mathematics. The session will give examples of practice with commentary on how strategies need to vary when linking science with different subjects.

2.3 IBSE Self-Reflection Tool for Teachers

Wynne Harlen, Susana Borda

Participants will be introduced to an adaptation of the diagnostic tool which teachers can use to review their progress in IBSE and identify where they may need further help.

2.4 Designing an in-service programme to develop IBSE taking account of research findings

Tina Jarvis

This presentation will explore the need to differentiate in-put according to teachers' original subject knowledge and pedagogical expertise; tutors' approach during in-service and in school; appropriate range of topics; use of equipment and materials; match to national and local needs; role of senior management; and importance of pupil motivation.

Session 3: Assessing Student Learning in IBSE

3.1 Assessment for formative and summative purposes

Wynne Harlen

The aim of this session is to clarify the differences between assessment used for formative and summative purposes, emphasising the key factor is the use made of the information rather than how the evidence is gathered.

3.2.1 Using students' work for formative assessment

Frédéric Pérez

Participants will explore, through concrete examples, strategies for integrating efficient formative assessment of student learning when teaching science by looking at students' work. Emphasis will be made on the assessment of conceptual science knowledge.

3.2.2 Using teachers' judgements for summative assessment

Jan Schoultz

To assess students' learning, teachers need to consider information about their work in different ways. Standardized tests are most often used in summative assessment, as a means to measure students' learning in relation to a given set of standards at a particular time. Even thought the information obtained from this kind of assessment is important, it can only evaluate certain aspects of the learning process. During the workshop I will discuss different ways to do summative assessment: What is the role of the teacher? How can we use and interpret results from the standardized tests? Why do students fail? How to balance and combine formative and summative assessment?

The Speakers

Susana BORDA is a PHD student in Anthropology of Childhood at the University Paris Descartes. She worked for three years as a research assistant at the Education Department (CIFE) of the Andes University (Colombia), where she coordinated several national and international educational projects, particularly within the Colombian IBSE program Pequeños Científicos. She joined the La main à la pâte (French IBSE programme) national team in September 2010 and is presently in charge of coordinating the Fibonacci Topic Group 2 ("Deepening the Specificities of Inquiry in Natural Sciences") and the Fibonacci Guidelines Editorial Committee.

<susana.borda@fondation-lamap.org>

Patricia CORIERI has a PhD in Fluid Dynamics. She has been working since 2001 at the Université Libre de Bruxelles (ULB) in the training and tutoring of primary school teachers. She is the local coordinator for the Fibonacci project in Brussels. She is responsible for a non-profit association carrying out an after-school IBSME project with children in deprived areas. At the von Karman Institute for Fluid Dynamics, she is coordinator of REStARTS, a FP7 project, that initiates collaboration between teachers and research institutions to develop didactic material for experiments in concepts of physics applied to the field of aeronautics.

<pcorieri@ulb.ac.be>

Marida ERGAZAKI holds a degree in Biology and a PHD. in Didactics of Biology. She is a Lecturer at the Department of Educational Sciences and Early Childhood Education of the University of Patras in Greece. Her research work is concerned with how learners construct their own understanding about the biological world and how they might be supported in this process with appropriately designed learning environments.

<ergazaki@upatras.gr>

Wynne HARLEN has held several high ranking positions in scientific education and research in the UK, including Sidney Jones Professor of Scientific education at the University of Liverpool and Director of the Scottish Council for Research in Education. She has an honorary position as Visiting Professor at the University of Bristol, England, although working from her home in Scotland. She acts as consultant to several primary/elementary school science projects in various countries and is currently committed to the IAP Scientific education Programme on the development of inquiry-based scientific education. She is the author of 28 books and of many journal articles and reports on scientific education, evaluation and student assessment. She is a member of the Fibonacci Scientific Committee and is closely advising the work of the Fibonacci Topic Group 2.

<wynne@torphin.freeserve.co.uk>

Tina JARVIS is Emeritus Professor of Education at the University of Leicester and UK Coordinator of the EU Fibonacci Project. Her main activity and research has been to develop and promote innovative in-service science education as well as to carry out research on factors that influence the impact of in-service training and other types of intervention to improve attitudes and understanding of science and technology.

<jar@leicester.ac.uk>

David JASMIN, PHD in Physics, has been working in science education and science popularization since 1995. He is a Research Engineer at La main a la pate (French IBSE programme) since 1997 and Head of this programme since 2005. He is the author and the editor of various books on primary science education. He was the Scientific Coordinator of the POLLEN Project and is presently the Scientific Coordinator of the Fibonacci Project.

<david.jasmin@fondation-lamap.org>

Katarina KOTUL'ÁKOVÁ, PHD, is a lecturer at Chemistry Department of the Faculty of Education at Trnava University. She studied chemistry and biology at Trnava University and had her PhD in didactics of chemistry. Her research interests are pupils' understanding of scientific phenomena, science process skills and scientific literacy of society. She is recently involved in a professional development programme for in-service teachers and participating in several projects dealing with innovative approaches to science education and scientific literacy at a national and international level.

<katarina.kotulakova@truni.sk>

Anna PASCUCCI has a degree in Biology and a PHD in Molecular Biology at University of Naples. She is

Supervisor at the Interuniversity School for Teachers' Education in Natural Sciences (SICSI) and National Senior expert (Ministry of Education and INVALSI) for the training course on the OCSE-PISA survey. She is the Italian coordinator of Volvox Project FP6 EU and a Member of the National Coordination Group of the ISS Plan (Teaching Experimental Sciences), supported by the Ministry of Education. She is a member of the National Committee for the development scientific culture and the President of the Italian Association of Natural Science Teachers – ANISN. She is the Italian responsible of the International Biology Olympiad (I.B.O.) and the Italian coordinator of the Fibonacci Project TC2 Naples.

<anna.pascucci@gmail.com>

Frédéric PÉREZ, a former primary school teacher, worked as a teacher trainer and pedagogical adviser for 20 years. He then joined the La main à la pâte (French IBSE programme) national team in September 2009. He is presently in charge of teachers' professional development and of the follow-up of part of the French national network of pilot centres. He holds a Master's degree in Didactics of Physical and Chemical Sciences at the University Paris Diderot.

<frederic.perez@fondation-lamap.org>

Jan SCHOULTZ is Professor Emeritus in Science Education at Linköping University (Sweden). His research focuses on two overlapping areas. The first is about how students are socialized into school science, how the interaction between teachers and pupils and between pupils is manifested in the classroom and how students and teachers are involved in and learn to master the scientific words, terms and concepts. The second area problematizes the practice-related professional skills of teachers and the relationship between university studies and placement studies in teacher education.

<jan.schoultz@liu.se>

Clémentine TRANSETTI has a Master's degree in Neurobiology and then specialized in scientific communication and popularization works in La Rotonde, a science centre integrated into the Graduate School of Engineering of Saint-Etienne (France). For six years now, she has been in charge of coordinating the European projects on science education Pollen and Fibonacci at the local level. In the frame of these two projects, she has already trained and supported more than 300 teachers in their science teaching.

<transetti@emse.fr>

David WILGENBUS, astrophysicist, has been a member of the La main à la pâte (French IBSE programme) national team since 2001. Former webmaster of the La main à la pâte website, he now coordinates the implementation of large-scale interdisciplinary learning modules for teachers, in particular the in projects "Living with the Sun" (health education), "Calendars, Mirrors of the Sky and the Cultures" (in the frame of the International year of Astronomy), "The Climate, my Planet and Me!" and "My House, my Planet and Me!" (Education for sustainable development : climate change, and housing). He regularly participates in science education events (conferences, trainings...) in France and abroad.

<david.wilgenbus@fondation-lamap.org>

Gabrielle ZIMMERMANN, PHD in Zoology, joined the La main à la pâte (French IBSE programme) national team in September 2010. She coordinates the implementation of a thematic learning module for teachers: «The School of Biodiversity». She is also involved in some actions of the Fibonacci Project, in the organisation of the Lamap International Seminar, and is in charge of organising the 2011 edition of Graines de Sciences (one-week meeting between elementary science teachers / teacher trainers, and research scientists).

<gabrielle.zimmermann@fondation-lamap.org>

Kristina ZOLDOSOVA, PHD, is graduated in specialization of science education teaching for lower level of secondary education. She works at the Trnava University Faculty of Education in Slovakia since 2002 as an assistant lecturer. Her main area of interest is innovation of preschool and primary science education. Her research deals with problems of science literacy development in the Slovak educational environment. She is especially interested in the science process skills at use when building scientific knowledge. She is presently searching for the easiest way to implement Inquiry-Based Science Education in the relatively conventional and strict Slovak educational system so that it will work and move the educational results forward.

<kzoldos@truni.sk>

Partners

European coordination

France - *La main à la pâte* (French Academy of Sciences, *Institut national de recherche pédagogique*, *École normale supérieure Paris*). For the purpose of Fibonacci, the *École normale supérieure* is the legal entity coordinating the project.

Scientific coordination

Science: **France** – *La main à la pâte* Mathematics: **Germany** – University of Bayreuth

Reference centres

Austria – University of Klagenfurt **Denmark** – University College South Denmark **France** – ARMINES/ Graduate School of Engineering of St Etienne **France** – Graduate School of Engineering of Nantes **Germany** – Free University of Berlin **Germany** – University of Augsburg **Germany** – University of Bayreuth **Netherlands** – University of Amsterdam **Slovakia** – University of Trnava **Slovenia** – University of Ljubljana **Sweden** – Royal Swedish Academy of Sciences **United Kingdom** – University of Leicester

Twin centres 1

Belgium – Free University of Brussels **Bulgaria** – Institute of mathematics and informatics of the Bulgarian Academy of Sciences **Estonia** – University of Tartu **Finland** – University of Helsinki **Greece** – University of Patras **Ireland** – St Patrick's College **Portugal** – Ciencia Viva, National Agency for Scientific and Technological Culture **Luxemburg** – University of Luxemburg **Romania** – National Institute for Lasers, Plasma and Radiation **Serbia** – Vinca Institute for Nuclear Sciences **Spain** – University of Cantabria **Switzerland** – University of Zürich.

Associated partner for the Greenwave project

Ireland – Discover Science and Engineering - Discover Primary Science.

Twin centres 2

Austria – Pädagogische Hochschule Wien **Belgium** – Dienst Katholiek Onderwijs **Denmark** – NAVIMAT, Danish National Centre for Mathematics Education **Denmark** – VIA University College **France** – PRES de l'Université de Lorraine **Germany** – Cologne & Bonn Chambers of Commerce and Industry **Germany** – Thüringer Institut für Lehrerfortbildung **Italy** – National Association of Science Teachers **Poland** – Jagiellonian University **Spain** – University of Alicante **Turkey** – Academy of Sciences/TUBA **UK/ Scotland** – University of Glasgow **UK / Northern Ireland** – Queen's University Belfast.

Contact details

La main à la pâte – FRANCE

+33 (0) 1 58 07 65 97

contact@fibonacci-project.eu

WWW.FIBONACCI-PROJECT.EU