The Fibonacci Project

DISSEMINATING INQUIRY-BASED SCIENCE AND MATHEMATICS EDUCATION IN EUROPE

Fibonacci Newsletter

Issue n° 04 - July 2012

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SEVENTH FRAMEWORK PROGRAMME

Expanding the Fibonacci network and starting a new cycle

Fibonacci is now entering its final phase: the dissemination phase, through the entry of new partners into the project. In line with the Fibonacci sequence mathematical model, the first transfer cycle (from Reference Centres to TC1s and TC2s), which lasted two years, is complete, and TC1s are now in the position of Reference Centres, able to start a new cycle by tutoring new centres. Thus, 26 new players, the Twin Centres 3 (see p. 7), have been selected as associate Fibonacci partners for the last 8 months of the project, and twinned with one Reference Centre or TC1. We wish them a warm welcome!

This newsletter also highlights two examples of achievements, in mathematics and in science, reached by two Twin Centres 1, the University of Zurich and the University of Luxemburg, during the project.

As the project is maturing, new resources are also being developed by the various Fibonacci partners, contributing to the dissemination objectives of the project outcomes.

The newsletter also presents further recommendations made by the Scientific Committee and the external evaluator to ensure the optimal dissemination of the Fibonacci results. These will be some of the key points discussed during the final Fibonacci seminar, on 3 and 4 December 2012 in Trnava, Slovakia.

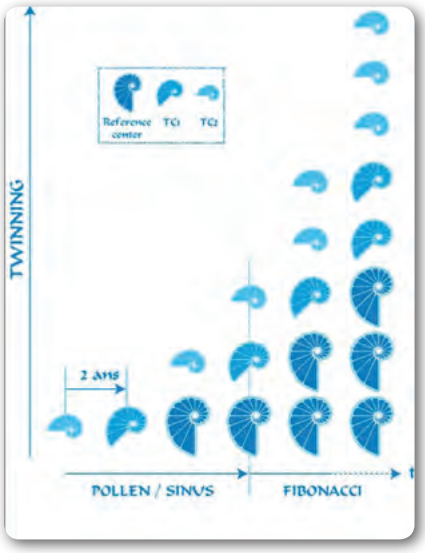


Diagram of the Fibonacci cycles

Second European Conference

Inquiry Based Science & Mathematics Education
Bridging the gap between education research and practice

The Fibonacci Project European Conference was held at the University of Leicester, UK, 26-27 April 2012. It was organised by the School of Education, University of Leicester in cooperation with the Fibonacci European coordination team.

The Conference disseminated and explored strategies for improving inquiry-based science and mathematics through research and evaluation of innovative practice. Delegates came from 28 countries in Europe and beyond.

There were 39 papers and 12 posters presented following review by two referees in the autumn. Presenters came from 21 different countries including many from the Fibonacci Project as well as from other European countries and some as far afield as USA, New Zealand, Brazil and Colombia. Presenters varied from practicing teachers to very experienced researchers.

Sessions covered "Pupils' and teachers' practice from early years to 18 year olds in different countries", "Integrating mathematics and/or science inquiry into the school curriculum", "Nature of science, "Using ICT to promote investigative work", "Professional development for teachers and student-teachers", "Involving scientists in developing investigations", "Different strategies for assessment and self-assessment of inquiry activities", "Support for disseminating practice between European countries and related issues", "Use of outdoor learning sites".

Among the workshops, a stimulating activity was offered with "Operation Montserrat": a group of delegates experienced an e-Mission which is a video conference simulation managing a natural disaster. The group played the part of an international rescue team using real data from the hurricane and volcano that hit the island of Montserrat. Delegates needed to handle data about the hurricane and volcano to make decisions concerning whether and how to evacuate the island population.

The conference dinner was at the National Space Centre. During the evening delegates saw a 'Space Show' and had private access to the whole of the Centre.

European Training Sessions

September 2011-March 2012

In the 3rd Fibonacci newsletter, we reported about the first one of five European training sessions, organized by the University of Leicester between 12 and 15 September 2011. Since then, the four other training sessions have taken place.

Using the External Environment of the School

Monday, October 10th to Wednesday, October 12th, 2011. Helsinki, Finland.

In the European Training Session *Using the External Environment of the School* 10-12th of October 2011 in Helsinki, the main themes were bridging the gap between informal learning and formal education and applying the IBSME approach in science education. During the training session, a special pedagogical three-step-model of IBSME was utilized. Three phases – pre-visit, visit and post-visit – facilitate embedding a science centre visit better to school's curriculum.

European Training Session focused on activities in different environments outside the school and gave participants opportunities to get involved in these sessions and activities. During three days, participants got to know the Finnish system of teaching with the external environment of the school. The training session consisted about lectures and workshops at Science Centre Heureka and in Department of Teacher Education in the University of Helsinki. Furthermore, workshops were organised at Suutarila Lower Comprehensive School and at The Viikki Teacher Training School. In addition there were the really external workshops that took place at Nature House Villa Elfvik, Nature Centre Solvalla and Harakka Nature Centre. Teachers and educators, mainly from the Fibonacci project, were invited to present their ideas and share their experiences and knowledge concerning IBSME activities carried out in informal environments.

The training session participants went to the Finnish forest

Implementing and Expanding a Reference Centre

28th to 30th of November 2011 in Berlin, Germany

48 participants from 15 countries took part in the he European training session in Berlin. They participated in workshops and discussed the main topics concerning the implementation and growth of a reference centre that wants to promote inquiry-based learning in schools: inquiry-based science and mathematics education, continuous professional development of teachers, material support, the importance of the curriculum, community involvement, evaluation.

The event took place at the Richard Grundschule Berlin, one of the collaborating primary schools within the TuWaS! project. The choice of the venue was deliberate although an uncommon place for a conference, which was valued by most but not all participants.

The training session offered a mix of workshops, lectures, as well as a round-table and a visit of an exhibition of teaching materials from the different countries of the topic group "Implementing and Expanding a Reference Centre" (Austria, Belgium, Denmark, Serbia, Slovenia, Berlin). Members of the topic group as well as their Fibonacci colleagues also contributed workshop sessions giving insight in their project focus thus offering a broad European perspective.

Louise Hayward & George McBride of Scotland shared their expertise in the integrity of change. The talk was followed by a workshop in which the Change Game was played, which was a great success since it was lend to different Fibonacci partners afterwards. The exhibition of materials and resources for teachers was a further highlight for many visitors, since it gave the chance to compare and discuss.

At the Round table session participants learned about the importance of networking. They took the chance to talk to different members of the Berlin community out of the education department, foundation, industry and local business who support the TuWaS! project.

The workshop Using notebooks by Prof Petra Skiebe-Corrette and Dr. Sandy Ledwell AMSTI was considered very useful. The presentation was disseminated to several Fibonacci partners.

The attendants got easily into discussion and practiced enthusiastically the hands-on introduction to inquiry-based learning. The social program in the German capital in cold November days provided perfect networking opportunities.

Deepening the understanding of inquiry in mathematics

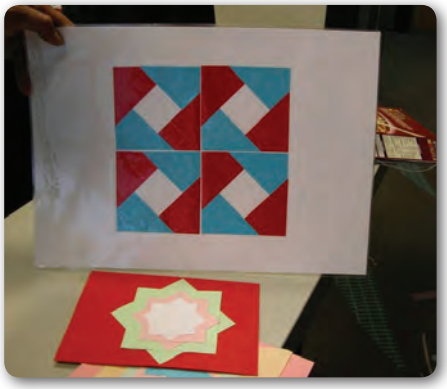
15 – 17 February 2012, The university of Bayreuth, Germany

The seminar covered manifold aspects of inquiry-based mathematics education, such as enhancing appreciation of mathematics, enhancing confidence in one's own ability to be able to deal with mathematics, application of mathematical knowledge to mathematical and non-mathematical tasks, the ability to use mathematics as a form of communication and expression and improving mathematical thinking. Moreover it focused specifically on an inquiry-based approach establishing successful ways for realising these elements and on certain fundamental guiding concepts that typify instruction of inquiry-based (respective problem-oriented) mathematics education at school.

There were 81 participants at the seminar coming from 12 European and one African country (Zimbabwe).

The training session aimed at:

- promoting a deeper understanding of what IBME is about
- showing that IBME strengthens the appreciation of mathematics,
- showing that IBME fosters students' self-confidence to deal with mathematics
- expanding on the guiding concepts of IBME: strengthening attention to learning strategies and learning processes as well as problem solving instruction and learning mathematics in context
- giving examples of the application of mathematical knowledge to mathematical and non-mathematical tasks



Deepening the Understanding of Inquiry in Natural Sciences

The Fibonacci Training Session 5 took place **in Sèvres (France) from March 21st to 23rd 2012**. It gathered 68 participants both internal and external to the Fibonacci project, from 21 different European countries. Participants had the opportunity to deepen their understanding of Inquiry-Based Science Education (IBSE) by defining it in terms of teaching and learning practices at the different levels of schooling. An important part of the programme of the training session was structured around the Fibonacci IBSE Diagnostic Tools, which provide teacher trainers with the means to diagnose teachers' training needs, and teachers with the means to improve their teaching practices through formative self-assessment. Participants used the tools to make observations in real classroom contexts and were asked to reflect upon the specificities of IBSE at the Kindergarten, Primary, and Middle School levels. Participants also attended seminars where the different stages of implementation of IBSE were conceptualized and priorities for each stage were made clear. Other workshops addressed issues such as strategies for designing teacher continuing professional development programmes and the assessment of student learning in IBSE.

Cultural and social activities were also a highlight of the Training Session. The most widely appreciated was the "Tasting of Specialties", during which each participant shared with the others a traditional dish from their country of origin.

Practical workshop on astronomy in Sèvres, France

The Fibonacci Resources for Implementing Inquiry in Science and Mathematics at School

Resources for Implementing Inquiry in Science and in Mathematics at School is the new title given to the two sets of complementary booklets which are being developed in the Fibonacci Project, and which will on the one hand define the general principles of IBSE and IBME and their implementation, and on the other hand summarize the outcomes of the project and the lessons learned throughout the process. Two types of Resources will be published in December 2012:

Companion Resources (titles an design to be edited)

Background Resources

The Background Resources are being prepared by the members of the Fibonacci Scientific Committee. They define the general principles of inquiry-based science education and inquiry-based mathematics education and of their implementation. They will include the following booklets:

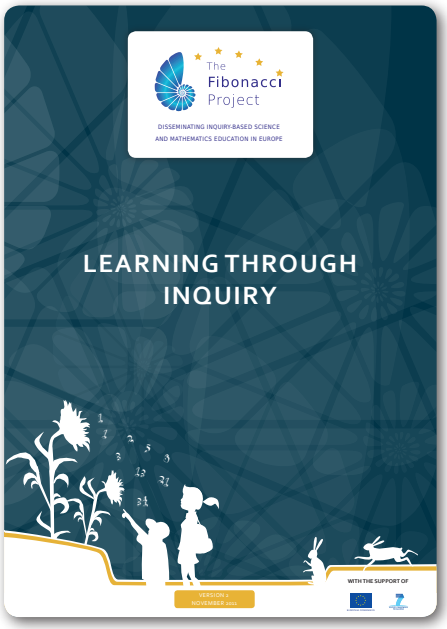
- ★ Learning through Inquiry
- ★ Inquiry in Science Education
- ★ Inquiry in Mathematics Education
- ★ Designing a Centre for Science and/or Mathematics Education

Companion Resources

The Companion Resources will provide practical information, instructional ideas and activities, and assessment tools for the effective implementation of an inquiry-based approach in science and mathematics at school. They will be based on the three-year experiences of five groups of Fibonacci partners who focused on different aspects of implementation. The Companion Resources will summarise the lessons learned in the process and, where relevant, will provide a number of recommendations for the different actors concerned with science and mathematics education (teachers, teacher educators, school directives, deciders, policy makers...). They will include the following booklets:

- ★ Implementing Inquiry in the Natural Sciences
- ★ Implementing Inquiry in Mathematics
- ★ Setting up, Managing and Expanding a Centre for Science and/or Mathematics Education
- ★ Integrating Science Inquiry across Curricula
- ★ Implementing Inquiry beyond the School

All the booklets will be made available, free of charge, on the Fibonacci website, within the Resources section.



Greenwave Europe 2012

The European Greenwave project commenced with a first campaign in 2011 and continued in 2012 in collaboration with the Fibonacci project coordinators in 17 European countries. The aim of Greenwave Europe is to observe the onset of spring as it arrives in Europe and spreads across the continent. It is a collaborative science project for primary schools which is part of the Fibonacci project.

Greenwave promotes an inquiry-based approach to looking at the arrival of Spring, in multi-disciplinary way, using the external environment of the school.

- ★ In total in 2012, 127 teachers (down from 246 in 2011) from 13 countries participated in Greenwave Europe.
- ★ Participants submitted a total of 1,567 official records of a range of species and information on weather conditions (down from 1,888 in 2011).
- ★ In addition 1,505 photos were submitted to the website (down from 1,640 in 2011).
- ★ These data were used to generate maps and charts showing the arrival of the signs of spring in Europe.

As in 2011 there was substantial variation in the number of observations from each country. This year Romania had the highest number of records and observations followed by Serbia and Slovenia. Frogspawn and Swallow were selected as the mandatory species common for all countries. Observations were received from six countries for each mandatory species, while records of Frogspawn and Horse chestnut were most commonly reported.

Photo Gallery

The photo gallery continues to provide a visual record of the work being done by schools all over Europe and in particular the countries with high levels of participation.

Spanish chestnut

Horse chestnut

Ash

Frogs

Swallow

Map of all sightings in 2012

As can be seen on the map above there is a higher concentration of records from Romania and Serbia.

Twin Centres 3 (TC3)

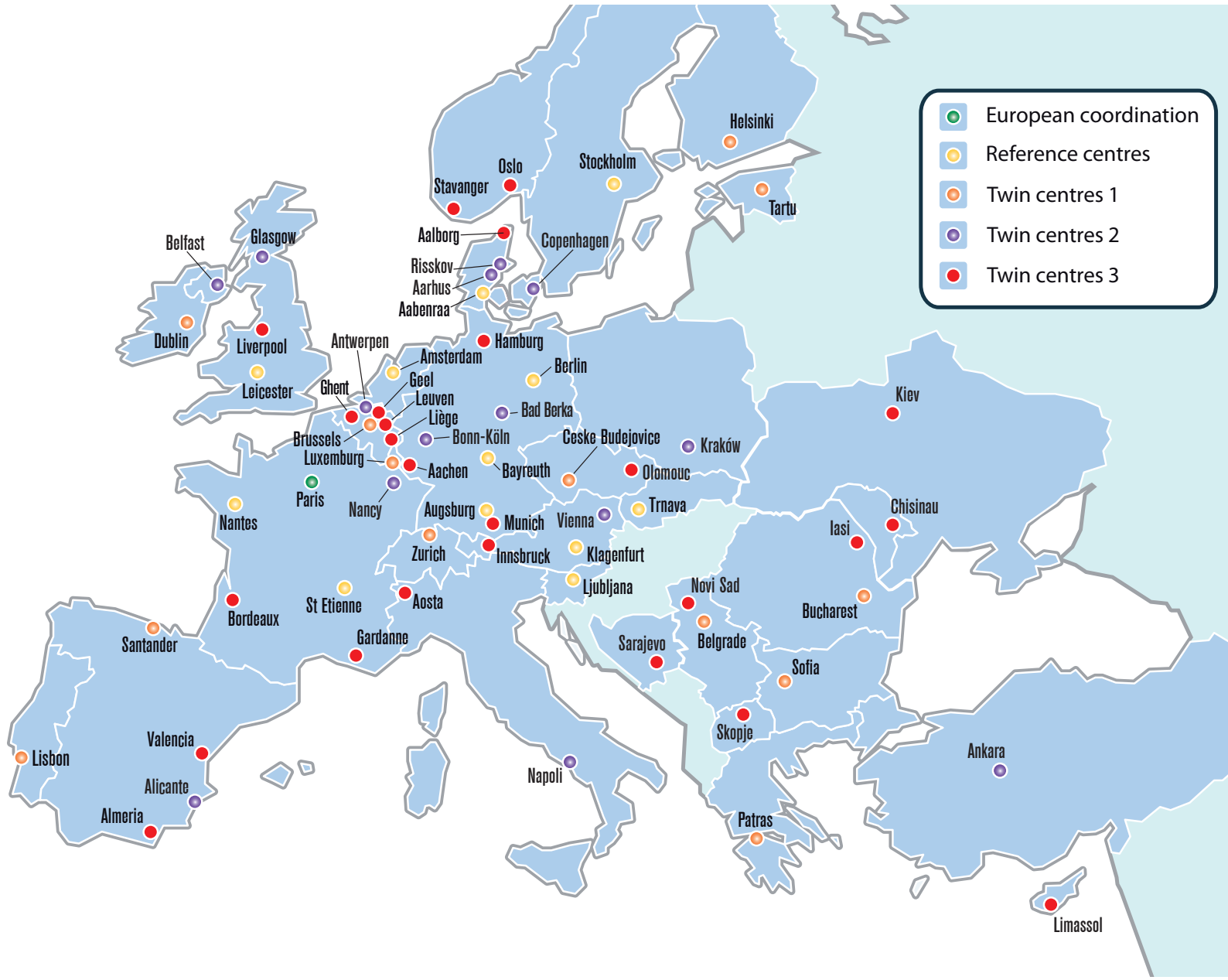
At the end of the project, the TC1s (Reference Centres-in-progress) will have been raised to the position of Reference centre, and the TC2s (Reference Centres-in-progress, but at a "lower" stage) to the position of TC1.

This scheme is now reproducing itself, with a growing number of Reference Centres providing more support for a growing number of centres-in-progress.

On the last year of Fibonacci, a larger dissemination scheme is using the 24 (12 old and 12 new) Reference Centres to get new interested partners inside the Fibonacci process: the TC3s. Field visits will be organized for these new partners, showing how this process can become a strategy for increasing dissemination.

Each TC3 is now twinned to one centre (RC or TC1) and will have the opportunity to send three persons during 3 days to visit that centre. The visits will enable them to know more about IBSE and IBME and their regional implementation. The field visits will be organized between June 2012 and February 2013. A catalogue of field visits will be prepared by the reference centres and the European coordination.

After an open call for TC3s, the 34 applications received were carefully reviewed by the scientific committee, and 26 were selected, which brings the total number of Fibonacci centres to 60, and allows new countries to join in the project, like Bosnia Herzegovina, Cyprus, Macedonia, Moldova, Norway and Ukraine.



TC1s: Focus on mathematics Focus on science

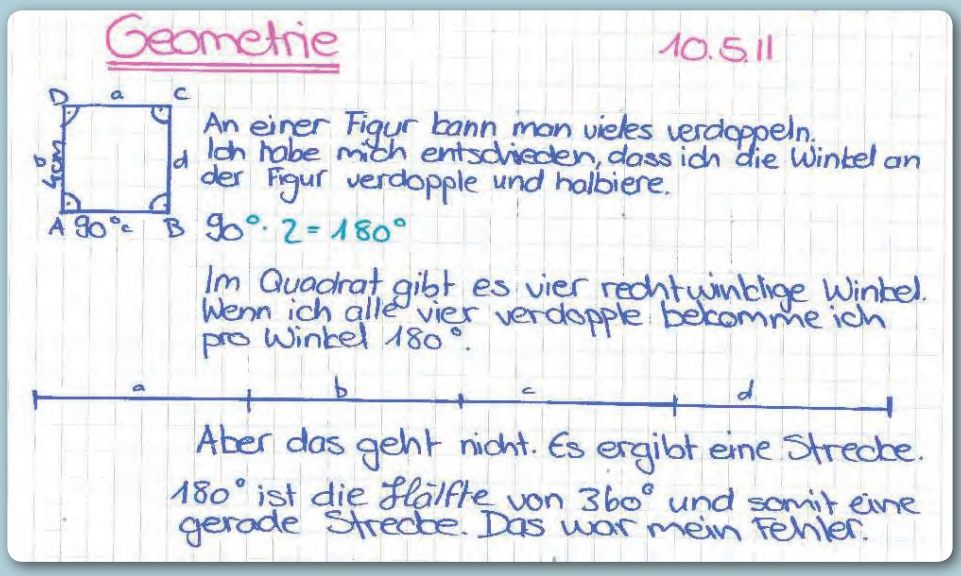
Dialogic Learning in Mathematics Classes at the Swiss Twin Centre 1 (University of Zurich)

Within the framework of the German Sinus project, the University of Zurich (Switzerland) had established a sound mathematical-didactical contact with the Universities of Augsburg and Bayreuth. It was due to this relationship that Switzerland was invited to participate in the role of a TC1 within the EU's Fibonacci project. One of the Swiss centre's trademarks is the Dialogic Learning, which was developed by Urs Ruf and Peter Gallin while teaching German and mathematics at grammar school level. As university professors, they continued to underpin their discovery scientifically. Dialogic Learning is one of many possible realisations of IBSME (Inquiry-based science and mathematics education).

The goal of Fibonacci in Zurich was to familiarise a number of mathematics teachers ranging from first year primary school to the last year of grammar school with Dialogic Learning. The radical change from traditional teaching methods requires that the teacher only make a relatively small but attractive offer and that the students document their working in a research journal. Because the teacher sifts through all journals and discusses interesting contributions in class, especially those that build a base to further pursue the matter, the aspect of student use (Fend) is given adequate room. The three pillars of motivation (Deci & Ryan) – the need for autonomy, the need for social relatedness and the need for competence – are thus reinforced.

An example from classes by Markus Jetzer at a lower secondary school in Schlieren shall illustrate the fundamental difference between Dialogic Learning and a traditional approach: A common introduction to scaling (homothetic transformation) usually involves some sort of explanation how a geometric shape is transformed into another using a scaling centre and a scaling factor. Instead of this and without any further introduction, Markus Jetzer gave the students the following task: Here you see a square and a triangle. Construct shapes that are twice the size or half the size of the given shapes. What do "twice the original size" and "half the original size" mean to you ?

The entries in the students' journal could not have been wider apart from each other. An astonishing number had assumed that "twice the original size" had referred to the area, while others insisted that the lengths of the sides had been meant. This, of course, led to a highly interesting and vivid discussion during the following lesson. A most creative girl even posed the question in her journal what things could be doubled. Her initial idea, which however she had not pursued, was to double the angles. Not even a trainer in mathematical didactics could think of something like this ! The following picture shows how she tackled her self-induced problem. After she had noticed her «mistake», she finally felt at ease to deal with the question and went on to solve the task in her journal.

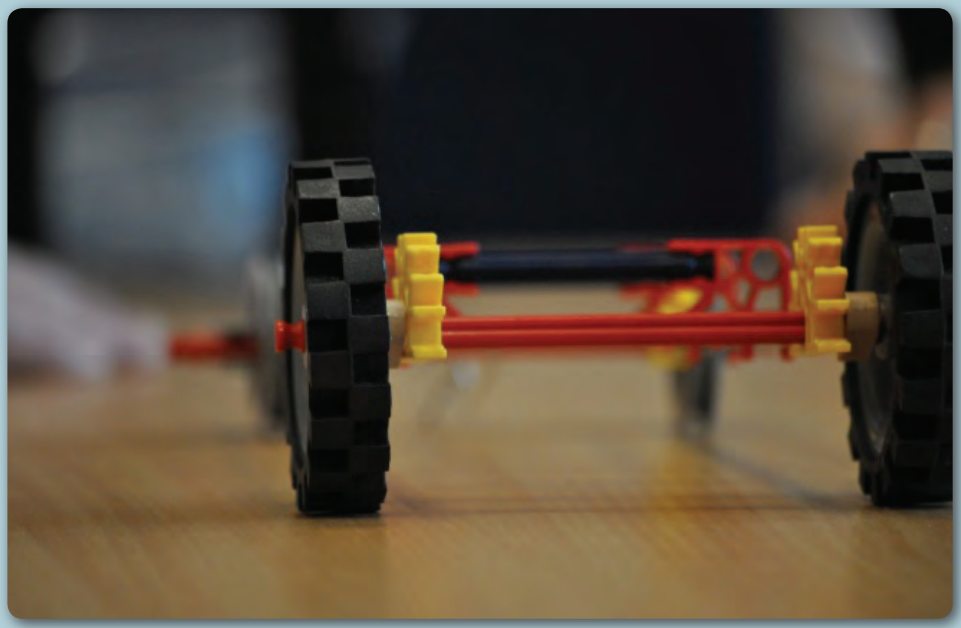


An example from classes at a lower secondary school in Schlieren

University of **Luxemburg**

The University of Luxembourg is participating in the Fibonacci project as a TC1, focusing specifically on the teaching of science at the primary level. The objective of the Luxembourgish component of Fibonacci is to promote Inquiry-Based Science Education by working in partnership with teachers to support the implementation, and adaptation, of science curricula. In particular, Continuing Professional Development is aimed at being responsive to teachers' contexts and needs. As such workshops formats range from focusing on strategies for teaching science, to content specific approaches to particular subject areas, and to the adaptation of curricula to specific classroom contexts. As Luxembourg has a multi-lingual school system, a complementary focus within Fibonacci has been techniques for supporting language development science teaching.

During the past two years, more than 60 classroom teachers in grades 4, 5, and 6 have benefitted from ongoing workshops supported through the Fibonacci project that focus on teaching chemistry and physics in the primary curriculum. There are three possible levels of professional development, ranging from kit-based experiences through to open-ended activities focusing on practices of inquiry, and teachers can choose the level of involvement they would like in the project. The activities of the Fibonacci project Luxembourg have coincided with a recently launched national Science Resource Network, which has enabled Fibonacci participants to also participate in the larger science education community. For the coming school year, Fibonacci Luxembourg seeks to continue to create new structures for teaching and learning science while supporting structures already in place through the Fibonacci project.



Activity on motion and design: constructing vehicles and conducting tests on speed and distance

Disseminating the project outcomes: questions to Pierre Léna (Scientific Committee member)

Asked about the dissemination strategy of the outcomes of Fibonacci, Pierre Léna made some suggestions during the last scientific committee and steering committee meetings in Leicester in April 2012.
Various possible lines of approach were suggested:

1. At a national level, Ministries and parliaments could be approached, as they are the appropriate political level of dissemination.
2. National representatives at the European Commission should be included in the loop, as well as national representatives in the European Commission working group on MST (mathematics, science and technology).
3. A summary book on Fibonacci, translated in the main languages, and showcasing the best Fibonacci productions (resources, booklet, Resources for implementing inquiry, guidelines, etc.), practices and lessons learnt could have a great impact.
4. Another dissemination strategy could be to publish a 1 to 2 page "Fibonacci in numbers" leaflet (results, key achievements), conveying the message that due to the particular nature of the subject, change in science education is a long process (it takes at least 10 years to achieve measurable and sustainable change), and that one must therefore think long term.
5. In a broader way, one should look at the dissemination role Europe can play outside of Europe.

A renewal of science education in Europe

Views and Actions of National Academies

A report of the ALLEA Working Group Science Education

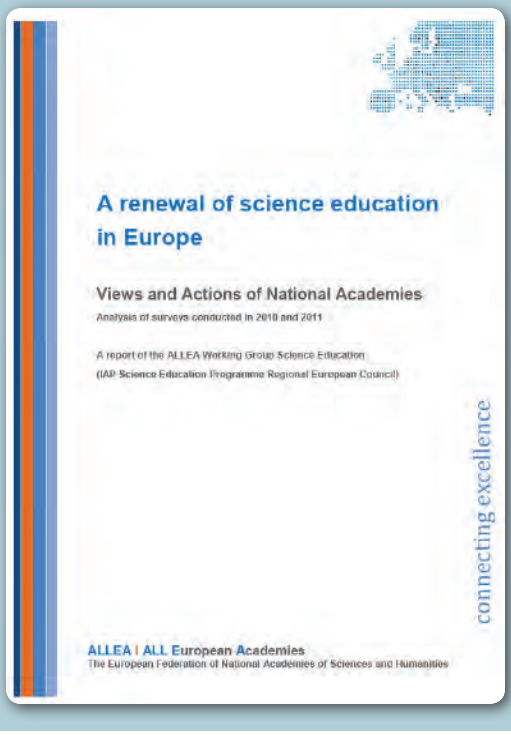
Fibonacci has received endorsement from several prestigious scientific bodies and Academies of sciences.

Following a detailed survey conducted in 2010 and 2011 among its 25 members, the ALLEA (ALL European Academies) Working Group on Science Education has recently published an important report, sent to the European Commission, on the impact of EU-funded projects on the rejuvenation of science education at national level.

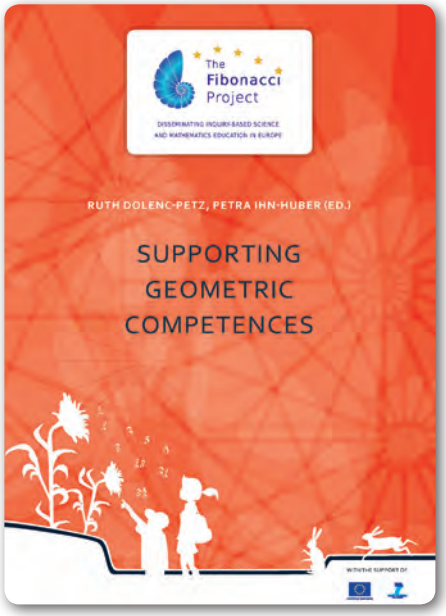
The report evidences in which ways the seed money put by the EU into projects aimed at renewing science education has promoted positive changes in the various national systems. It also comprises recommendations on further advancing the reform.

In addition to a general introductive analysis and conclusive recommendations, the full report involves detailed contributions from some 25 European countries: qualitative narratives about the promotion of inquiry-based science education (IBSE) in schools, networking and peer learning through EU co-funded projects (Fibonacci is mentioned), means available under the subsidiarity principle for the most appropriate local implementation of this renewal, interaction with the national and local educational authorities, institutional solutions and role of leading scientists for science teacher training, informal science events, etc. In order to renew science education in Europe, the report mainly pleads for IBSE extension and for a strong effort on the side of science teacher training (pre and in service), through a better interaction at the level of the national educational systems, between the scientific community and stakeholders in politics, society and corporate sector.

The report can be downloaded on the ALLEA website: <www.allea.org>



New resources



Supporting Geometric Competences.

R. Dolenc-Petz, P. Ihn-Huber (Ed.)
University of Augsburg, Germany (TC1)

New Fibonacci Publication for Mathematics Education in Primary School. This book has been written for primary school teachers who would like to support geometric competences of their children. In view of heterogeneity in many classes, it is necessary to consider the pupils' different talents and needs in learning.

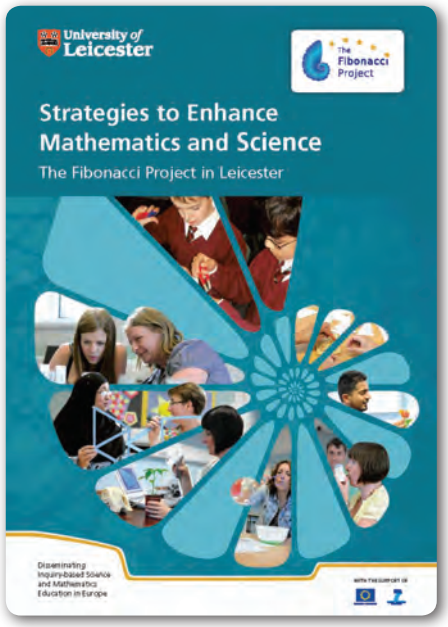
This books offers 14 topics for geometry lessons in primary school, which are based on the curriculum but also develop a deeper understanding of mathematics. Of course geometric phenomena first of all should be discovered by the children in a very concrete and practical way. Therefore this book initiates concrete handling with solids, shapes, symmetries, matches, plans, patterns, ... and it offers several worksheets at different levels to each chapter.

The worksheets can be used in various teaching situations:

- ★ The topics can be worked on regularly in school together with all children, and the tasks can be assigned according to the students' levels of mathematical proficiency.
- ★ The exercises can be used as additional tasks for very interested pupils to work on either at school or at home.
- ★ The topics are also suited for study groups outside of the classroom setting, where pupils deal with mathematical problems.

The tasks encourage the pupils to explore through inquiry-based learning. Therefore, the children will take the roles of explorers who discover mathematics.

The book is available on the Fibonacci website <http://fibonacci-project.eu> in the part "Resources – Examples of activities in mathematics". Some printed copies can be ordered freely by e-mail to: <petra.ihn-huber@math.uni-augsburg.de>



Strategies to Enhance Mathematics and Science.

University of Leicester, UK (RC)

The Leicester Fibonacci Project aims to develop a more integrated approach to science and mathematics education for teachers to enhance the scientific and mathematical practice of pupils in the 4-13 age range.

Teachers' sessions within the first year of the project have included

- ★ Investigation and measuring
- ★ Averages and sample size
- ★ Active graphing
- ★ Looking for patterns
- ★ Classifying and exploring the significance of shape

In the second year the focus on these continues but also include: Shape, Area, Perimeter, Volume, Ratio and Proportion.

At all stages the aim is to focus on both mathematics and science concepts and skills.

Projekt Fibonacci v Sloveniji.

University of Ljubljana, Slovenia (RC)

A presentation of the activities in the Slovenian Fibonacci classes and kindergarten groups was published in a booklet. It aims to present the variety of topics and activities offered to the pupils by the teachers involved in the Fibonacci project, to promote the project among the teachers and to raise the awareness of the impact of the project in the society.

Exploration of microworld

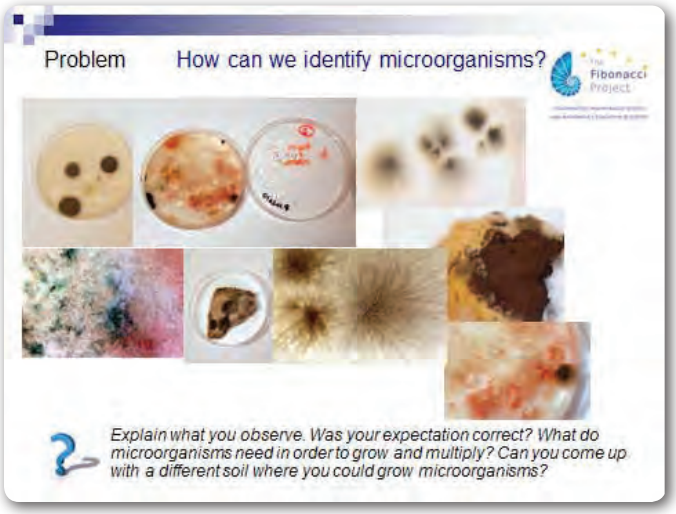
(lower secondary - ages 11-12)

University of Trnava, Slovakia

This module offers IBSE activities about exploring the microworld. Three topics are presented.

Microorganisms are explored through their metabolic activities (decay of paper, production of CO_2 by rising dough, fermentation), nutrients and conditions needed for their vital activities are also determined. Work with variables is tested in activities preventing microorganisms from growing (conservation of food). Students compare methods used to measure the amount of CO_2 produced.

The module is available in the "Resources" section of the Fibonacci website <www.fibonacci-project.eu>



Scientix: search for innovative science teaching resources and have them translated in your language!

The Scientix resource repository collects various materials for science and mathematics classroom - lesson plans, guidelines, hands-on experiments, etc. from EU and other national and international education projects.

You can search the repository by topic, target group, language or keyword. If you would like to use some of them in your teaching, but they are not in your preferred language, you can request an additional translation via the 'Scientix translation on demand service'.

The service is free of charge and available only through the Scientix website. Go to <**www.scientix.eu/web/guest/request-translation**> to find out more!

Some facts and figures of the Fibonacci intermediate external evaluation report of May 2012, by Educonsult

According to the external evaluation, the Fibonacci Project has achieved much more than it set out to do:

In May 2012, around 3,000 teachers, 600 schools and over 72,500 pupils had been involved in the project, which already exceeds the minimum target of 2,500 teachers and 45,000 pupils envisaged by the end of the project. All of the Centres have organised continuing professional development (CPD) for the teachers. In many cases, these sessions have been recognised by ministries of education in order to give the teachers credits for their participation. In all cases, the CPD was followed by mentoring of the teachers who had been trained. Several countries have also largely involved pre-service teacher education, with modules developed by the centres (which has also exceeded the project's original objectives). On a scientific level, the Scientific Committee has reached a consensus on a definition of IBSE and IBME, and the partners have gathered and shared new expertise about their specificities.

The Centres involved are integrating IBSE and IBME in their professional development courses or policies and facilitating its further growth. Several Fibonacci partners have developed strong local and regional networks structured through regional coordinators, as well as involving multiplier teachers. Many local and regional activities have been set up to disseminate the achievements to other schools and teachers.

Regarding the twinning of the RCs and TCs, the evaluation (January 2012) has shown that the activities were beneficial to nearly all of the centres in terms of knowledge, practice and expertise.

Exchanges initiated from RCs and TCs have also taken place beyond the given twinning groups and more than 80 % of the centres reported that they want to continue their collaboration.

The initial analysis of the evaluation questionnaire for the teachers (though based on a less than 10% response rate) points towards some highly promising and positive results. They highlight that quality IBSE and IBME has a clear impact on the knowledge, skills and attitudes of the pupils and on the confidence and motivation of teachers to teach mathematics or science in general and to teach in an inquiry-based way in particular.

A positive impact on the teachers…

83% of the Fibonacci teachers stress that the continuing professional development (CPD) and mentoring received by RC and/or TC has increased their knowledge on making pupils learn through enquiry. 80 % of the teachers stress that their motivation to teach science and/or mathematics has been stimulated, and 78% stress that their linking mathematics, science and technology (MST) with everyday life to make it more attractive for the pupils has been facilitated. 77% of the teachers highlight that the Fibonacci CPD courses have increased their knowledge and skills on how to implement IBSE or IBME, and as many that the courses enhanced their confidence to teach MST. 75% of the teachers mentioned that the project has developed their ability to make students use appropriate MST methods such as IBSE or IBME.

…as well as on the pupils

88% of the teachers state that teaching in IBSE and/or IBME way has stimulated interest and motivation for learning MST among their pupils, increasing their ability to learn from their mistakes. 87% of the teachers highlight that it has developed the ability of pupils to work in a scientific way. 85% mention that it has strengthened the basic knowledge of pupils concerning MST. 84% of the teachers stress that IBSE or IBME work has strengthened the team building skills of the pupils and 83% that the IBSE or IBME approach has facilitated linking MST knowledge with everyday life.

Showing the way forward for sustainability

The Fibonacci project definitely contributes to promote innovation through IBSME in science and maths education. However, the Fibonacci partners are very much aware that innovation processes such as the promotion of IBSE or IBME take time and require continuity in its implementation. This is why the sustainability of what has been achieved so far and the integration or mainstreaming of the achievements of the Fibonacci project in the education systems across Europe need particular attention. To reach this, **two key elements** have to be supported: on the one hand **the creation and development of more references centres across Europe** which can support more schools (and teacher CPD) and on the other hand **more and stronger support of the regional or national educational authorities** which have to promote the dissemination of IBSE or IBME **at regional or national level**.

What is the Fibonacci Project?

The ambition of the Fibonacci Project is to contribute to the dissemination of inquiry-based science and mathematics education throughout the European Union, in ways that fit with national or local specificities. It defines a process of dissemination from 12 Reference Centres to 25 Twin Centres, based on quality and a global approach. This is done through the pairing of Reference Centres selected for their extensive school coverage and capacities for transfer of IBSME with 12 Twin Centres 1 and 13 Twin Centres 2, considered as Reference Centres-in-progress. In the last phase of the project, a larger dissemination scheme will involve 24 new partners (Twin Centres 3), expanding it to almost all European countries.

Started on 1st January 2010 for a duration of 3 years, the project is coordinated by the French *La main à la pâte* programme, with a shared scientific coordination with the University of Bayreuth (Germany).

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