University of Leicester

The Fibonacci Project

Integrating Inquiry Across Curricula

Monday 12 – Thursday 15th September 2011
University of Leicester



Disseminating Inquiry-based Science and Mathematics Education in Europe

WITH THE SUPPORT OF

EUROPEAN COMMISION

SEVENTH FRAMEWORK PROGRAMME

Integrating Inquiry Across Curricula

This seminar sets out to explore how to make effective links between science and different school curriculum areas in order to support learning in each subject, without losing the development of quality inquiry methods.

There are different approaches. Educationalists involved in primary education usually think of making links between science and other subjects such as mathematics and language. However educationalists involved in secondary education tend to focus on making links between physics, chemistry and biology. These different approaches will be reflected in different sessions during the Seminar.

Speakers

The Nature of Science – Michael Reiss

Professor Michael Reiss has particular expertise in science education and bioethics. This talk will examine what is meant by 'the nature of science'. It will look at whether science always proceeds by the objective and rigorous testing of hypotheses, or whether there are other factors at play in deciding whether one scientific view comes to hold sway within the scientific community over alternatives. "I will also contrast science as undertaken by scientists and science as undertaken in school science lessons. My argument is that school science too often presents a narrow view of what science is and how it is undertaken. School science needs to engage more richly with science outside of the classroom as well as in the school laboratory."

Linking Out-of-school Activities to a Cross Curricular Theme – Rosemary Feasey

Rosemary Feasey is a leading expert in primary science who developed cross curricular strategies with teachers in the Pollen Project in England. Extending children's experience to out-of-school activities should be an integral part of cross curricular themes; this is where children will have opportunities to encounter curriculum areas such as science and mathematics in contexts which are familiar as well as challenging. This session looks at what those contexts might be and opportunities they offer.

Using a Science Centre to Develop Science Inquiry at Snibston Discovery Centre – Rosemary Feasey

This is an interactive museum, historic colliery railway with outside play areas and a Country Park and nature reserve. All these facilities are located on the site of a former Colliery. Rosemary Feasey will use this centre to illustrate how inquiry can be developed from a visit to a Science Centre.

Sessions and Workshops

Cross Curricular Issues: an Introduction – Tina Jarvis

A progression can be identified to help teachers to integrate inquiry across the curriculum effectively. Initially teachers and pupils need to understand the inquiry approach and have developed confidence and some competence in the concepts and skills of the subjects they are linking. This session will review the work already carried out by members of the Fibonacci Sub-Group on developing this progression.

Understanding of Inquiry in Different Subjects – Janet Ainley

The concept of 'inquiry' is often used in different ways by different subject specialists. It is important to appreciate these differences to minimise misunderstandings during collaborative work linking more than one subject. This session provides an opportunity for exploration of this issue and discussion.

Science, Maths and Technology Work in Middle Schools – Carl Rauch

The Fibonacci Reference Centre of Nantes (France) has been supporting for many years primary and middle school teachers in implementing investigation. Focusing on integrating inquiry in middle schools, this workshop will deal with some sequences developed during the last years (water, energy, bridges, waste recycling). At least two teachers from different subjects (among mathematics, physics and chemistry, biology, technology) are committed to each sequence. The aim of the workshop is to give concrete examples and to describe the main features of the teaching situations encountered in the classrooms.

Linking Mathematics and Science: Work in Leicester Schools – Frankie McKeon and Leicester teachers

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. Project teachers will illustrate the approaches adopted with examples of work they have undertaken with children in their schools.

Harmonic oscillation: A multi-faceted approach – Dagmar Raab

Using mathematics for a deeper understanding of physical phenomena is a traditional approach in physics lessons at secondary schools. On the other hand real life examples can help to implement an inquiry approach in mathematics lessons. Dagmar suggests that it is possible to find out physical laws and new mathematical aspects in parallel. Participants will be able to interact, experiment and discuss this idea based on the example of harmonic oscillations. Suggested real experiments will lead to a concept of cross-curricular inquiry.

Language and Science in Luxemburg – Joelle Vlassis and Chris Siry

Strategies for incorporating language skills in IBSE activities in the multilingual context In Luxemburg science teaching has to be done in German, which is not the usual language for either students or teachers. In the Fibonacci project, we have planned to involve the teachers in IBSE activities with the perspective of using these activities as opportunities for the pupils to speak and to write German. During the workshop, the initiatives and the difficulties of the Luxemburgish teachers for implementing IBSE while using German for both writing and speaking will be discussed. Our observations show that few teachers speak or invite their pupils to speak German. German is seen by some teachers as an obstacle for speaking and understanding science. They would prefer the pupils speak in their mother tongue, i.e. the Luxemburgish, rather than in German.

Pathways through In-Service Training – Sue Bull and Janice Griffiths

The national network of Science Learning Centres provides a range of high quality in-service for all those involved in science education from Early Years, Foundation Stage to post-16. This session will consider how in-service needs analysis in a school can take place; how to plan for effective in-service education; and the different pathways that can be taken through a comprehensive in-service programme to best support staff at all stages of their careers.

Integrating Mathematics and Science through Inquiry – Janet Ainley

In this session Janet will use examples of inquiry-based activities to demonstrate how the Leicester team is integrating mathematics and science. Our approach aims to support teachers in planning for progression in both subjects, using science as a context for the purposeful use of mathematical ideas, and drawing on the mathematical ideas that underpin understanding of science concepts.

Ideas for teaching about Nature of Science in Class – Cliona Murphy

Participants will have the opportunity to engage with and reflect on a range of innovative inquiry-based activities that focus on teaching about different aspects of the Nature of Science (NoS). These interactive approaches will help teachers to promote ideas about science as a human activity; its subjectivity and objectivity; the creativity and imagination in scientific inquiry; and the influence of history in scientific inquiry. The activities are suitable for use in primary and post-primary classrooms, and can be linked effectively with existing curricula.

Running a Science Day – Dan and Adelina Sporea

A 'Science Day' can present the results and celebrate an investigation project lasting several months. This interactive lecture will introduce the participants to the methodology (and tips) in organising an event highlighting these goals including selecting the right location, physical and financial resources, timetabling, promotion and follow-up. The session will also consider issues related to running an effective educational project that will be presented on the "Science Day", including selection of the project subject, materials, sponsorship, implementation and evaluation.

Time table

<table>
<tr><th>Monday 12th September</th><th colspan="3">Tuesday 13th September</th><th colspan="3">Wednesday 14th September</th><th colspan="2">Thursday 15th September</th></tr>
<tr><td rowspan="3"></td><td>9.00 – 11.00
Harmonic Oscillations: A multi-faceted approach
Dagmar Raab</td><td>9.00 – 11.00
Pathways through In-Service Training
Sue Bull & Janice Griffiths</td><td>9.00 – 11.00
Integrating Mathematics and Science Through Inquiry
Janet Ainley</td><td>9.00 – 11.00
Developing Science & Mathematics with Pre-Service Teachers
Frankie McKeon</td><td>9.00 – 11.00
Strategies for Linking Language & Science
Liz Hewitt, Joelle Vlassis, Tomas Tenno & Leicester teacher</td><td>9.00 – 11.00
ExperimentsAtSchool
Neville Davies and Katharine Richards</td><td>9.00 – 11.00
Bright Ideas in Mathematics
Therese Dooley</td><td>9.30 – 11.15
Poetry & Magnetism
Sue Dymoke & Tina Jarvis</td></tr>
<tr><td colspan="3">Break</td><td colspan="3">Break</td><td colspan="2">Break</td></tr>
<tr><td colspan="3">11.30 – 12.30
Key Note: Rosemary Feasey
Linking Out-of-School Activities to a Cross Curricular Theme</td><td colspan="3">11.30 – 12.30
Key Note: The Nature of Science
Michael Reiss</td><td colspan="2">11.30 – 12.30
Plenary Discussion of Major Issues & Panel of Cross Curricular Issues Group</td></tr>
<tr><td>Buffet Lunch</td><td colspan="3">Lunch 12.30 – 1.30</td><td colspan="3">Lunch 12.30 – 1.15</td><td colspan="2">Lunch 12.30 – 1.30</td></tr>
<tr><td>2.00 – 3.00
Cross Curricular Issues: an Introduction
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Ideas for Teaching about Nature of Science in Class
Cliona Murphy</td><td>2.00 – 3.45
Running a Science Day
Dan Sporea & Adelina Sporea</td><td colspan="3" rowspan="2">1.15 Leave by bus
2.00 – 5.00 Visit to Snibston
2 groups – first group will look around the centre while the second has a workshop. Then the groups will change round.
Liz Hewitt & Anupma Mishra
Return by 6.00</td><td colspan="2" rowspan="2"></td></tr>
<tr><td colspan="2">Tea</td><td colspan="3">Tea</td></tr>
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Science, Maths & Technology Work in Middle Schools
Carl Rauch</td><td>4.15 – 6.00
Linking Mathematics & Science Activities in Leicester Schools
Frankie McKeon & Leicester Teachers</td><td>4.15 – 6.00
Graphing in Science & Mathematics
Ed van den Berg</td><td>4.15 – 6.00
Using Botanical Gardens to develop Science & Mathematics
Ruth Godfrey</td><td>4.15 – 6.00
Using History & Geography as a Context for Science
Tina Jarvis</td><td colspan="3"></td></tr>
</table>

Accommodation will be in the University of Leicester's flagship John Foster Hall located in attractive pavilions. Each room has state-of-the-art facilities including en suite bathroom, Internet and telephone access, refreshment facilities, towel and toiletries selection.

Graphing in Science and Mathematics – Ed van den Berg

Now that our computers and sensors do the constructing, can graphs be used in the lower age range? Ed will suggest that they can. He will show that even in the lower grades of elementary school children can work productively with graphs. Consequently the teaching of graphical presentations as part of the elementary mathematics curriculum should be rethought and reworked in a completely different sequence. There will be some activities with sensors to produce graphs as well as discussion on a curriculum sequence across different grade levels.

Using Botanical Gardens to Develop Science and Mathematics – Ruth Godfrey

This will be a hands-on workshop experiencing a range of primary and secondary science and maths activities at the University of Leicester Botanic Garden with a particular focus on using outside space to stimulate learning. The session will be led by Ruth Godfrey, the Botanic Garden Education Officer. The Garden hosts 9,000 children annually on taught education programmes.

Using History & Geography as a Context for Science – Tina Jarvis

Strategies need to be slightly different for linking science with literacy and mathematics compared to the subjects like history, geography, physical education and religious education. One way is to use subjects like history and geography to provide a context in science topics such as 'forces' and 'biological studies'. The other approach is to include science investigations within topics such as 'Hindu celebrations' and 'World War II'. This session will present activities successfully trialled by Leicester teachers.

Developing Science and Mathematics with Pre-Service Teachers – Frankie McKeon

Pre-service primary teachers have to learn to teach both mathematics and science. How confident are they to do this? How secure is their understanding of collection and handling of data in science investigations? This session will provide some insights to the pre-service teachers' understanding and some approaches to develop their practice.

Strategies for Linking Language and Science – Liz Hewitt, Joelle Vlassis and Tomas Tenco

This session will explore a variety of practical ideas on ways to support language learning alongside science and maths. The presenters will also discuss how English teachers support pupils whose first language is not English; the Luxemburg situation where science has to be taught in German which is not the language of either the teachers or pupils; and the Estonian experience where Russian teachers need to teach in Estonian to pupils who speak Estonian.

ExperimentsAtSchool – real data and real learning from online and offline data production – Neville Davies and Katharine Richards

This workshop will demonstrate several experiments that enable school-aged learners to produce and share data from designed experiments either run over the Internet or carried out in school. The workshop will be useful for teachers of science and other subjects where data are key to helping understand the world around us.

Bright Ideas in Mathematics – Therese Dooley

According to Polya (1957), 'bright ideas' are at the centre of mathematical inquiry. In this workshop, participants will explore mathematical tasks which allow for multiple entry points and solution strategies and will reflect on factors that facilitate or inhibit bright ideas. They will also be shown examples of the collaborative construction of such ideas by pupils aged 10 – 11 years. Particular attention will be given to the role of vague language and the kind of teacher moves that support such language. The workshop is relevant to those involved in both primary and secondary mathematics.

Poetry and Magnetism – Sue Dymoke and Tina Jarvis

Sue Dymoke is a poet and anthologist with a particular interest in the processes of writing poetry and how these are taught in schools. She worked with teachers in the Pollen Project in Leicester. They found using science inquiry to stimulate poetry has helped pupils' creativity, motivated reluctant writers to participate and provided assessment opportunities for the teachers. This session explores how a study of magnetism can stimulate poetry.

Plenary and Cross Disciplinary Panel

A panel from the 7 countries of the Cross Disciplinary Group will lead a discussion and review of the main issues that arose during the week. This information will inform the Fibonacci final publication on 'Integrating Inquiry Across Curricula'.

This seminar is open to both members and non-members of the Fibonacci network. Participants will be selected according to the requirements of the Fibonacci Project. There are 60 places (approx. 40 from the Fibonacci Project and 20 from non-members.)

No fees: Accommodation Costs £189 for 3 days including conference dinner. Day rate £69 plus £20 conference dinner on Wednesday.

The Fibonacci Project

Booking Form

INTEGRATING INQUIRY ACROSS CURRICULA

Please complete clearly

Name: ..... Male or female? .....

Personal email: .....

Address: .....

..... Postcode: .....

Telephone: ..... Fax: .....

Please indicate below any special requirements (accessibility / dietary) you have:

.....

Organisation: .....

If your organisation IS already a member of the Fibonacci network

- Are you an RC, TC1, TC2 or other .....
- Please give the names of any colleagues who are also submitting a booking form for this Seminar .....

If your organisation is NOT a member of the Fibonacci network

- Does your organisation plan to become a Fibonacci Centre? ☐ YES ☐ NO
- Does your organisation participate in any education projects at European level? ☐ YES ☐ NO

  If Yes which ones? .....
- What do you hope to gain from participation? .....

Accommodation (Please delete where appropriate)

Monday 12th September 2011

I will / will not require lunch on 12/9/11
I will / will not require an evening meal on 12/9/11
I will / will not require B&B accommodation on 12/9/11

Tuesday 13th September 2011

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Wednesday 14th September 2011

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I will / will not require the conference dinner on 14/9/11
I will / will not require B&B accommodation on 14/9/11

Thursday 15th September 2011

I will / will not require lunch on 15/9/11

The Fibonacci Project

Workshop Choices

Please indicate your choice of session below with a tick. We will do our utmost to ensure you attend the session you choose. However in some circumstances this may not be possible as we wish to keep group sizes manageable.

Monday 12th September 4.15 – 6.00 (Please choose 1)

Science, Maths and Technology Work in Middle Schools ☐

Linking Mathematics and Science Activities in Leicester Schools ☐

Tuesday 13th September 9.00 – 11.00 (Please choose 1)

Harmonic Oscillations: Multi-faceted approach ☐

Pathways through In-Service Training ☐

Integrating Mathematics and Science through Inquiry ☐

Tuesday 13th September 2.00 – 3.45 (Please choose 1)

Language and Science in Luxemburg ☐

Ideas for Teaching about Nature of Science in Class ☐

Running a Science Day ☐

Tuesday 13th September 4.15 – 6.00 (Please choose 1)

Graphing in Science and Mathematics ☐

Using Botanical Gardens to Develop Science and Mathematics ☐

Using History and Geography as a Context for Science ☐

Wednesday 14th September 9.00 – 11.00 (Please choose 1)

Developing Science and Mathematics with Pre-Service Teachers ☐

Strategies for Linking Language and Science ☐

ExperimentsAtSchool ☐

Thursday 15th September 9.00 – 11.15 (Please choose 1)

Bright Ideas in Mathematics ☐

Poetry and Magnetism ☐

Please return this form to

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Or fax both sides to +44 (0)116 252 5772

Or email both sides to iab6@leicester.ac.uk

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