

## SMART PROJECT

### Report on the 4<sup>th</sup> International Meeting

**Topics:** Examination of the results of the training in the schools. Validation of all the results and materials produced during the first project year. Analysis of the risks, weaknesses and strengths of the project.

**Location:** Radnoti School - Pécs (Hungary)

**Duration:** 6<sup>th</sup> - 9<sup>th</sup> September 2015

#### **Participants:**

#### **Applicant/Beneficiary:**

Carlo Anti School (Italy): Claudio Pardini, Laretta Zoccatelli and Chiara Tacconi

#### **Partners:**

MIUR (Italy): Massimo Esposito

University of Roma Tre (Italy): Carlo Meneghini

University of Turin (Italy): Marina Marchisio

Accademia delle Scienze (Italy): Chiara Mancinelli

Risorse in Crescita (Italy): no representative taking part in the meeting

TU Delft (Netherlands): Meta Keijzer-De-Ruijter

Chalmers University Gothenburg (Sweden): Jan Stevens

St. Thomas Gymnasium (Germany): Adelheid Hochstatter-Nitsche and Stephan Markthaler

Radnoti School Pécs (Hungary): Andrea Banò, Marta Zsbanné Hamory and Kajline Somogyi Ildiko

#### **Activities performed:**

#### **6th September, Sunday**

Arrival of all project partners in Pécs, hotel accommodation

Hotel Laterum (Pécs, Hajnóczy József utca 37-39)

[www.laterum.hu](http://www.laterum.hu)

#### **7th September, Monday**

Hotel Laterum, Conference Room

09.00-10.30 Report on the needs analysis (Marina Marchisio – Chiara Mancinelli)

Marina Marchisio illustrates the *Report on the needs analysis*, a document of fifty pages about the analysis on training and educational needs of Italian teachers of Mathematics and Science. She invites all the partners to make observations and proposals for any changes or integrations.

A booklet/volume on educational needs will be prepared with the contribution of all partners: it will be presented during the multiplier events in order to spread the project results and products. It will be published by the Accademia delle Scienze di Torino, as they are one of the project partners and also a publisher. The deadline set for the preparation of the contributions by all the other partners is 15<sup>th</sup> October 2015. Accademia delle Scienze will collect all the materials and edit the volume.

Marina Marchisio prepared an index of the book content and invites all the partners to discuss it:

#### Content

0. Introduction (a short one, written by the project coordinator Claudio Pardini)
1. The questionnaire on the training and educational needs of Italian Teachers of Mathematics, Physics and Science (by Brancaccio - Esposito)
2. Analysis of the questionnaire results of Italian teachers training needs (by Giraudo - Marchisio)
3. Some reflection on the Mathematics teachers needs (by Marchisio - Pardini - Barana)
4. Some reflection on the Physics and Science teachers needs (by Mobilio – Meneghini ...)
5. The Dutch contribution
6. The Swedish contribution
7. The German contribution
8. The Hungarian contribution
9. Conclusions (by Conte and Mancinelli)

Confindustria will contribute with a view about the relationship between the world of work and school.

All participants agree with the proposed index of content and with the deadline set for the contribution preparation.

Chiara Mancinelli of Accademia delle Scienze wrote two reports about *Pedagogical and disciplinary topics* and *Standard competences*.

#### - *Report on Pedagogical and disciplinary topics*

The objectives of the SMART project are improving teachers' professional competences and supporting innovation in the initial and in-service training system of Mathematics, Physics and Science teachers, but also developing competences, awareness and a constructive attitude in students so that they can improve their motivation in the study of Mathematics and Science. One of the main aims is to support innovation in the teachers' system of training through pedagogical solutions and innovative practices based on the new computer and multimedia technologies. In order to support this aim, the SMART project is developing the construction of two open online courses for Science and Mathematics teachers'. These courses contain different modules based on the adoption of innovative technologies like Maple and Maple T.A. They are aimed to a teaching which supports the students' learning with a constant formative assessment, but also projected to verify the acquisition of mathematical and scientific competences.

The first step in order to develop the open on line courses was the identification of pedagogical and disciplinary topics. This was based on the analysis of training and educational needs of Italian Mathematics and Science teachers compared with training needs in the other countries (Germany and Hungary) involved in the project and according to the specification of the OECD.

The work group has chosen four disciplinary topics for Science: Methods in Science, Chemical and Physical systems, Living organisms and Earth Science.

The Mathematics topics were chosen according to the four main areas indicated in the PISA 2012 Assessment and Analytical Framework, within a number of subtopics: Quantity (quantitative reasoning), Space and shape, Change and relations and Uncertainty. Working on these topics the work group is now developing the Modules and Didactic units to be used in the online courses.

- Report on Standard competences

Acting on the professional competences of teachers leads to the direct consequence of improving the students' competences and therefore to a general positive effect on the school system.

In order to be effective, the Mathematics and Science teachers need to have good knowledge of their subject, good competence on how to teach it and the necessary flexibility to adapt their methods to all students' training needs. However, it is very difficult and expensive to reach a great number of teachers to refresh their competences.

An effective method is to improve the cooperation between them and the sharing of their best practices through web platforms, social networking sites and other online resources.

The work group is working on the definition of educational models to be shared at a European level for the training of teachers through the development of a database containing best practices and innovative didactic materials. These materials will help supporting teachers' professional competences and innovation in the initial and in-service training system but also developing competences, awareness and a constructive attitude in students.

Following the identification of disciplinary topics agreed at the partnership level, two pilot Open On line Courses (OCCs) will be prepared, one for Sciences and one for Mathematics.

The methodology used in the planning of the Science OCC is that of the P&PBL (Project & Problem-based Learning), in the belief that the traditional Science's teaching/learning doesn't stimulate curiosity towards natural events and everything related to the phenomenology observed in the reality. The main objective is to give teachers the necessary support to organize, manage and improve experimental activities by using in particular materials and instrumentation available in daily life (day-life laboratory).

The methodology used in the planning of the Mathematics OCC is that of the PP&S (Problem & Posing Solving), in the belief that the traditional teaching/learning of Mathematics doesn't allow to understand its pervasiveness, its depth and its important applications in everyday life.

The methodology consists in starting from a real situation in order to stimulate the capacity of solving a problem after having paid attention to its posing: the students will not simply mechanically apply learnt formulas or "prepackaged recipes", but they are put in front of a problem which can't be attributed to something they know and they don't have the method that leads them to the correct result. This method can be found at the end of a research path in various stages, from the reduction of the problem in simpler and more easily resolvable parts to the assumption of new points of view and of different possible directions.

The teacher guides the students to the research of a problem solution in four stages: understanding the problem, devising a plan, executing the plan, checking the results. Through this methodology, each student will develop independent judgment, creative thinking, awareness of his capacities, ductility and flexibility in the research of solutions. In the solution research the students will learn how to use an Advanced Computing Environment, ACE, which allows them to concentrate on the solution, visualize the problem, hypothesize strategy solutions and above all get rid of the calculation technical rigidity. The competence acquisition in the use of ACE will also allow the

students to be better prepared for the world of work in which these environments are used in an essential way above all for the simulation.

10.30-13.00 Maple tutoring courses for teachers: Examination of the results of the training in the schools - observations on the courses carried out in June – analysis of their results.  
New tutoring courses in September for teachers about materials and their use with the class  
(Marina Marchisio - Radnoti School teachers - St. Thomas School teachers – Carlo Anti School)

The teacher training which took place in June consisted in four sessions of one hour each on the project platform. Teachers of Science and Mathematics from Germany and Hungary took part. There was also a teacher from Greece who Marina Marchisio met at a Maple TA Conference in New York in May and who was interested and asked to attend these sessions.

The topics were about how to use Maple, how to use ACE Maple and how to use Maple TA with some examples. The lessons were recorded and can be found on the platform by anyone who is interested. The Maple licenses were given free of charge to all the participants; the licenses for the school laboratories will be soon sent to the partner schools: the teachers are asked to let Marina Marchisio know the number of licenses needed by each schools.

Comments on the teacher training by the teachers:

- German teachers: the online tutoring was clear and useful. The teachers also used Maple by themselves, in their work, after the end of the tutoring lessons.
- Hungarian teachers: five teachers attended the tutoring; they didn't use Maple or Moodle after the course because school had finished, but they intend to use this software in the new school year; they were very satisfied with the lessons.

Asynchronous tutoring will soon be activated through a forum so that the teachers can be supported during the experimentations with their classes.

The experimentation in the class with the students will start from 10<sup>th</sup> October 2015 for all schools. It must be decided how many classes and students will take part in the testing of materials. Each teacher can credit up to five classes. Each teacher will receive an Excel file and instructions in order to credit the students on the Moodle platform. Maybe the students will be given personal licenses, too.

The materials requested by the teachers were prepared and are now ready for them to be used in the class. Teachers, who have any other requests, should let Marina Marchisio know as soon as possible: it is important to keep in touch in this period because the eventual new topics have to be chosen and decided before the beginning of the experimentation.

A first check on how the materials experimentation is proceeding will be carried out during the meeting in Germany; after that, the experimentation will be continued until the end of the school year.

The schools will have to send Marina as soon as possible the names of teachers, the number of classes involved in the experimentation of materials, their level and the topics. The materials in the Mathematical OOC are of all levels.

The Mathematical Modelling OOC contains a collection of problems in the four topics chosen and agreed in the preparation phase. Each problem has a test in Maple TA.

Massimo Esposito and Anna Brancaccio will prepare some modules on the PP&S methodology for the OOCs. Tests with Maple TA will be prepared in collaboration with Chalmers University.

Marina Marchisio shows the different sections of the project platform with the updates and the new materials uploaded in the last months: a lot of new resources have been produced. Then she illustrates some examples of the many different topics and their related activities. The teachers will have to choose from a list of topics the ones that they intend to experiment from October to February: the minimum number is four problems, possibly from different topics, for each class involved in the experimentation.

Finally Marina Marchisio illustrates the section “SMART Sample Course”: at the beginning, there is a mind map which gives a general idea of the content and let users decide which path they want to follow. The section will be opened to all partners in a very short time.

All the partners agree that a logo must be prepared to copyright the project materials: it must be inserted in all Maple files; in the assignment files (pdf documents), in each question, a sentence must be placed which indicates that the materials were produced within the SMART project and can be used only for specific purposes.

13.00-14.00 Lunch (Hotel Laterum) Radnóti School

14.00-15.30 Presentation of the materials for Science (Carlo Meneghini - Meta Keijzer-De-Ruijter)

Carlo Meneghini shows and explains the course format for Science, which homogenizes the different scientific subjects; it is organized in modules, lessons and chapters. The first module, *Methods in Science*, has already been prepared and it is of interdisciplinary type. There is a course description at the beginning, with a list of objectives, a summary of the modules and the contacts. In each module there is a more detailed description, with objectives, prerequisites and a summary. An experimental sheet has also been prepared.

Carlo Meneghini shows some examples of lessons in Biology and Chemistry. The materials are for teachers but they can be adapted and used also in the class with the students.

The partners discuss about the possibility for Delft University to contribute some tests in Maple TA for Science: Carlo Meneghini thinks that this software could create some problems of portability for the materials to other platforms and limit their dissemination possibility.

Marina Marchisio believes that many types of tests can be prepared for the Science materials, not necessarily all in Maple TA, depending on what we want to test and evaluate for teachers and for students. This must be decided and carefully chosen, and then the tests can be prepared in Maple, in Moodle or with other modalities.

Prof. Meneghini thinks that Maple TA is difficult to use for the experiment parts: a direct feedback by teachers is more useful and very important at this stage in order to go on with the development of the modules.

Evaluation for teachers is essential in an OOC, according to Marina Marchisio: the two OOCs (Mathematics and Science) should be homogeneous in terms of teacher evaluation, which can't be only self-evaluation in an OOC.

Meta Keijzer-De-Ruijter and Carlo Meneghini believe that first of all the materials must be experimented by teachers: only if they are proven valid, they will be inserted in the Science OOC. The focus is on teachers at this stage: for this reasons, for the Science materials, there will not be any Maple TA assessment, but forums will be opened because they are the best and easiest way to keep in touch with each other and discuss problems, issues, how teachers carried out the experiments in their own class, the difficulties they met, how they managed to overcome them, etc. The majority of partners agree with this view and it is agreed that there will not be any Maple TA assessment for the Science materials in this initial experimentation phase.

The testing and experimentation of the Science materials by teachers in the classes will start in November as only one module is ready by now; in February, during the meeting in Germany, there will be a first check, as for the materials for Mathematics.

Two teachers of Carlo Anti School, three of St. Thomas and three (two for Physics, one for Biology) of Radnoti will be involved in the experimentation in Science. As soon as possible, schools have to send the names of these teachers to Carlo Meneghini.

15.30-17.30 Validation of all the results and materials produced during the first project year (Chair Massimo Esposito)

Marina Marchisio's *Report on the needs analysis* about Italy is validated; the other partners' contributions on the same topic are being collected within 15<sup>th</sup> October; Accademia delle Scienze will gather all the contributions, edit and publish them in book form.

The two reports written by Chiara Mancinelli of Accademia delle Scienze (*Pedagogical and disciplinary topics* and *Standard competences*) will be read by all partners and then validated during the meeting in Germany. Chiara Mancinelli will make some changes to the documents according to what has been decided today as far as the differences in the Maths and in the Science materials experimentation is concerned.

Mathematical materials will be experimented and evaluated through the project platform, which contains materials ready to be used for both teachers and students. Testing in the schools will start from 10<sup>th</sup> October.

The situation for Science is slightly different: the materials will be given to teachers, not directly to students; teachers will have to study them and work on them as they are not ready for the classes. There will not be any Maple TA assessment for these materials. The teachers will be then provided with templates to collect their feedback. Unlike for Mathematics, on the platform it will not be possible to see what the students do. Teachers will be supported with structured sheets to evaluate the materials and the use they make of them in the class. For Science, testing in the schools will start in the second part of November.

During the next meeting in Germany a first check and evaluation of the materials experimentation both for Mathematics and for Science will be carried out. For both subjects the experimentation will be prosecuted and completed in the second part of the school year.

Lauretta Zoccatelli informs the partners that the next meeting in Germany has to be postponed to 15<sup>th</sup> -17<sup>th</sup> February due to the Carnival festivities in Wettenhausen in the previous week.

By the end of September the project coordinator will have to complete an intermediate evaluation report so Lauretta Zoccatelli invites all the partners to check their email frequently in the following weeks in case she has to ask them urgent information to write in the document.

19:30 Dinner

### **8th September, Tuesday**

University of Pécs, Science Department

09.00-10.30 Implementation of the platform (Marchisio – Pardini)

The project website

The website is a show window of the project during its lifetime: in Marina Marchisio's opinion the newsletter has been a good idea because people, who receive it, can then go to the project

website and get more information about the project. Pictures taken during the meetings will be published; there will also be the meeting and webinar agendas, the reports and the documents presented during the international meetings. There will be a description of each partner institutions. The output section will contain a description of each of the three project intellectual outputs.

After the end of the project, the website will contain an overview and the completed products.

The Moodle platform of the project is composed of three sections:

1. The project activity section, which contains two courses:
  - The Working Group Course hasn't been used yet: all partners have already been credited so it would be a good idea to start using it. Here all materials like reports, agendas, etc. will be uploaded.
  - The Teacher Training Course has already been used with the teachers of Mathematics for the training and it has been useful. Another training course for teachers of Science will soon be opened: Settimio Mobilio, Carlo Meneghini and other professionals who prepared the materials will be credited as teachers.
2. The Open Online Courses section will contain the final materials when they are ready and completed; only the administrator will be allowed to upload materials here.
3. The Classes section is still empty: it will be opened to the students; Italian, German and Hungarian teachers have to send names, surnames and e-mails of their students so that they can be credited.

The Sample Category is temporary and will soon be moved to the first section.

A license Share-Alike 4.0 International in the Creative Commons website is selected for the project products. A logo of the project will be also prepared.

10.30-11.00 Analysis of the risks, weaknesses and strengths of the project.  
Realignment of the activities in relation to the objectives according to the timetable and the Gantt template. Evaluation of the meeting.  
(Chair Massimo Esposito)

Massimo Esposito invites all the participants to share their ideas about the possible risks, weaknesses and strengths of the project. In his personal opinion, a risk could be the management of the differences between the two OOCs, in Mathematics and Science: they should be kept as homogeneous as possible.

Radnoti School partners think that the timing can be a weakness and they don't know if the teachers will be able to test materials which are written in English. As regards the strengths, all teachers are open to experiment the new methodologies and are enthusiastic.

St. Thomas School representatives think that a problem could be Mathematics in the English language for some students who are weak in both subjects. In addition, the time, which is not much during the school year, could be another problem.

Carlo Anti representatives think that there will not be any particular problems with teachers who have been attending training courses in the subjects with these new methodologies for quite a long time.

11.00-13.30 Visit of the Department of Science of Pécs University  
Visit of the computer science and physics departments and of the botany gardens.

Lectures by Dr. Nemet Bela and Dr. Temesvári Agota of Pécs University, Science Department

Dr. Nemet Bela speaks about a Hungarian project for teaching Physics in an innovative way, focusing on motivation of students and a coordinating role of the teacher. In order to learn effectively, the students must be interested in knowledge; they should discuss what they learn not only at school, but also in their free time with their parents and friends, make several practical experiments, explain reality and experiments in their own words, use e-learning, the internet and other technology applications.

*Environmental Technical Physics* is the title of Nemet Bela's book for secondary school: it is currently available only in paper form but it is being improved with other new activities. He shows some example activities. What is new in this is the ecological point of view on Physics. There is a lot of work behind the book and a lot more has to be done. The teachers who decide to use this new book have to give the authors a feedback on a weekly basis.

Dr. Temesvári Agota is responsible for the teacher training in particular for Mathematics. There are two forms of teacher training in Hungary at the moment: one which refers to the Bologna System and another one which re-established the old system, more theoretical. There are three years of training for primary school teachers; twelve more semesters are necessary for teachers of secondary school. Special attention is given to core problems in teaching Mathematical subjects during these semesters.

13.30-14.30	Lunch
14.30	Town sightseeing and guided visit of Pécs Cathedral and Episcopal Palace
19:30	Dinner

### **9th September, Wednesday**

08.00 - 9.30	Visit of the laboratories of Pécsi Tudományegyetem – Babits Mihály – Gyakorló Gimnázium és Szakkozépiscola
10.00	Departure of all project partners