SMART
Science and Mathematics Advanced Research for good Teaching

Erasmus+

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SMART PROJECT –Second International Meeting in Delft (Netherlands)

The Second International Meeting was held in Delft from 11th to 13th March 2015. During the meeting the format to be used for the didactic modules in Mathematics and Science and the Open on line courses structure were defined. The four Universities chose the topics and the number of modules. The University of Roma Tre will prepared some videos on experiments within the itinerant laboratories; The University of Turin will prepare some video tutorials on how to use Maple and Moodle. TU Delft and Chalmers Universities will prepare some materials on Science and Mathematics.

The partner schools will have to experiment them: each institution will freely choose the modules to test, the age of students to administer them, the classes/groups and the most appropriate modalities for each specific situation.

On the 11th March Meta Keijzer-De-Ruijter and his collegues presented the Dutch education system. Diana Pennink explained how beta education is performed at TU Delft and underlined the need to improve Mathematics and Science in the Dutch education system. Meta Keijzer-De-Ruijter introduced TU Delft and TU Delft Extension School. Sylvia Walsarie Wolf illustrated how STEM courses are led in the Netherlands and how TU Delft is involved in them. Mathijs van Breukelen, a Geography teacher, explained what Technasium is.

Beta education refers to the so called 'exact sciences', such as Mathematics and Science, which need to be improved in the Dutch education system. Over the past decade a wide range of activities were put into place to incorporate more Maths and Science into the Dutch curriculum, ranging from primary to secondary schools and training for both primary and secondary (vocational) educators. But choosing a study into the field of Science and Technology does not always mean that students actually take a job in that field, making the involvement of industry into the activities an essential part of the deal.

TU Delft was founded in 1842. It hosts eight faculties: Architecture, Applied Sciences, Aerospace Engineering, Mechanical, Maritime & Materials Engineering, Technology, Policy & Management, Civil Engineering & Geosciences, Industrial Design Engineering and Electrical Engineering, Mathematics & Computer Sciences.

TU Delft Extension School was founded in 2014, is based on blended education and includes Massive Open Online Courses (MOOCs), Open Course Ware (OCW), Online Distance Education and On Campus Education. Its mission is to grow academic output and to improve quality of both campus & online education.

STEM (Science, Technology, Engineering and Mathematics) courses within the Dutch educational system have the image of being nerdy, require a lot of hard work and are no fun. An important moment in choosing future education is the choice of a specific study profile in secondary school: in HAVO and VWO education, students need to make a choice of the following 'profiles': Culture and Society, Economics and Society, Science and Health or Science and Technology.

In 2012 about 45% of all pupils in HAVO and VWO education chose a Science profile. For 2015 the target is set to have 55% of these pupils choosing a Science profile.

Technasium has been developed for upper secondary education (VWO/HAVO). Technasium creates secondary schools with a science profile in order for students to choose a school more to their liking. New subjects like research and design are taught and project assignments are based on the reality of science and technology-related professions within the scope of VWO, HAVO and higher education programs.

Platform Beta en Techniek

The Platform Beta en Techniek contributes to the Dutch knowledge economy by providing a good availability of beta technicians for the labour market. It puts a lot of effort into the education of technically skilled youngsters. Their strategy is characterized by focusing on the whole chain of education from primary to higher education and from government to industry.

This platform is the backbone to all kinds of activities directed on secondary education. It supports the different, regional networks between secondary and higher education **VO-HO Netwerken**. These networks focus on the following topics:

- Excellence for pupils (summercourses, Excellence Track, Masterclasses, etc.)
- Teacher training in STEM topics (teaching of excellent students, STEM teaching materials Development Teams)

THE DUTCH EDUCATION SYSTEM

Dutch Primary Education

There are eigth years of primary schooling. Children are placed in group one upon entry, and move up a group every year; different age groups may therefore be in the same class depending on when each child started. In their last year, 'Group 8' children in 85 percent of primary schools sit the CITO test in February, which advises their next level of education. As of spring 2015, all children in Group 8 will be required to sit a test to assess numeracy and language skills. The government sets attainment targets in six curriculum areas: Dutch, English, arithmetic and mathematics, social and environmental studies, creative expression and sports and movement.

Dutch secondary education

From 12 years, pupils choose from vocational or pre-university diplomas based on their ability. In the first years, all pupils study the same subjects (to different academic levels), known as the basisvorming, followed by a second stage in which specialist profiles are selected.

VMBO (a further four years of school): Prep school for vocational secondary education; those who achieve the highest level can enter HAVO studies. VMBO graduates must continue studying until age 18 or until they obtain a basic qualification (minimum MBO level 2).

MBO: Secondary vocational education. MBO programmes vary from one to four years depending on the level (1–4). If a student has successfully completed the Dutch VMBO the MBO can prepare pupils for work or, if level 4 is achieved, professional studies (HBO).

HAVO (five years): Senior general secondary education provides entrance to higher professional education at 'vocational universities'.

VWO (six years): Pre-university education prepares students for academic studies at a research university. VWO schools can be athenaeum, gymnasium or Technasium, a difference being that Greek and Latin are core subjects in gymnasium programmes and Design and Research are extra subjects in Technasium programmes.

Just under a third of the 659 secondary schools are run by the public authority. English and Mathematics are compulsory subjects. VMBO pupils study one modern language and HAVO/VWO pupils at least two. Other core areas include history, humanities, arts and sciences.