mascil
mathematics and science for life

Analysis of the Greek policy context

mathematics and science for life

mascil

mascil aims to promote a widespread implementation of inquiry-based teaching (IBL) in math and science in primary and secondary schools. It connects IBL in schools with the world of work making math and science more meaningful for young European students and motivating their interest in careers in science and technology.

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1.3 National report of Greece

PART 1: A DESCRIPTIVE, EVIDENCE-BASED ACCOUNT OF THE NATIONAL CONTEXT

Introduction: Organization of education in Greece

The structure of education in Greece and the associated 'types' of teachers and teacher education requirements are represented in the following figure:

Organisation of Education in Greece (linked to teacher education)

Grade	Age	Disciplines[1]	Type of school	Type of teachers[2]	Initial training[3]
1	4-5	M & S	Kindergarten	G	+4, Uni-DE
2	5-6	M & S	Kindergarten	G	+4, Uni-DE
*1	6-7	M & S	Primary	G	+4, Uni-DE
*2	7-8	M & S	Primary	G	+4, Uni-DE
*3	8-9	M & S	Primary	G	+4, Uni-DE
*4	9-10	M & S	Primary	G	+4, Uni-DE
*5	10-11	M & Phy	Primary	G	+4, Uni-DE
*6	11-12	M & Phy	Primary	G	+4, Uni-DE
*1	12-13	M & Bio	Lower Secondary	1D	+4, Uni-DSM
*2	13-14	M & Phy & Chem	Lower Secondary	1D	+4, Uni-DSM
*3	14-15	M & Phy & Chem & Bio	Lower Secondary	1D	+4, Uni-DSM
1	15-16	2M & Phy & Chem & Bio	Upper Secondary	1D	+4, Uni-DSM
2	16-17	2M & Phy & Chem & Bio**	Upper Secondary	1D	+4, Uni-DSM

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3	17-18	M & Phy & Bio**	Upper Secondary	1D	+4, Uni-DSM
1	Older than 15	2M & Phy & chemistry**	Vocational	1D	+4, Uni-DSM
2	Older than 16	2M & Phy & Chem**	Vocational	1D	+4, Uni-DSM
3	Older than 17	M & Phy**	Vocational	1D	+4, Uni-DSM

1. Maths and sciences (M&S), maths and physics (M & Phy), two mathematics courses (2M), Physics (Phy), Chemistry (Chem), Biology (Bio).
2. Generalist G, mono-discipline specialists 1D.
3. Number of years in tertiary education of training (+n), type of institution: University - Departments of Education (Uni-DE), University - Departments of Scientific disciplines including Mathematics (Uni-DSM)***.

*** Compulsory Education (primary and lower secondary)**
**** We refer only to compulsory common core subjects**
***** Particular Departments of Scientific disciplines including Mathematics may offer courses on pedagogy and/or didactics of the respective disciplines but these courses are not compulsory.**

The Greek educational system has traditionally maintained a centralized character. Decisions are made in practice from the Ministry of Education that is consulted by an organization called Institute of Educational Policy (IEP). In this context, the goals and framework for the education sector are defined by the IEP and the Government (Ministry of Education).

There is a national curriculum accompanied by a single textbook determined by the IEP for each school subject and grade, including mathematics and science. Reforms are mainly perceived as changes of the curriculum occasionally accompanied by short in-service seminars for teachers.

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In Greece pupils attend 9 years of compulsory education, from the age of 6 to the age of 15. This includes both primary education (grades 1-6) and lower secondary education (grades 7-9). At the age of 16, the students may start their upper secondary education, choosing the academic/general school or the vocational school. The vocational school qualifies students for particular specialisations. However, in the end of the last year of their studies students from vocational school have the option to participate in the national examinations for entrance to higher education (Technological Institutes).

Mathematics and Science are compulsory subjects, at all educational levels and they cover a considerable part of the weekly schedule.

(a) Mathematics

General aims and expected learning outcomes

According to national curricula the general aims of teaching Mathematics in all educational levels are to help pupils develop structured and critical thinking abilities; to improve their reasoning abilities; to sharpen their abilities of observation, self-concentration and persistence; to stimulate their imagination and freethinking; and to develop their sense of order, harmony and beauty.

Content

Primary School: problem solving, numbers and operations, measurement, geometry, gathering and processing data, ration & proportions, equations.

General secondary education: in upper secondary the content is: algebra, trigonometry, Euclidean and analytical geometry, statistics & probability, calculus; in lower secondary we have the basic elements of the above content except calculus.

Vocational education: algebra, trigonometry, Euclidean geometry, statistics, sequences, calculus.

(b) Science

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General aims and expected learning outcomes

According to national curricula the general aims of teaching Science in all educational levels are to introduce students to contemporary ideas and topics from the fields of Physics and Chemistry – always adapted to their intellectual ability and interests according to their grade level, and not at the expense of scientific validity. The achievement of the above aims can be facilitated by the use of new educational technologies. Modern pedagogical tools (educational software, the Internet, systems of synchronous reception and projection of measurements) enhance student ability to collect, analyse, visualize, model and report data. Due to their active participation the students will therefore be able to understand basic principles and laws of Physics and Chemistry.

Content

Primary school (Science):

Position and motions of bodies, electric power, water and wind energy, air, light, electromagnetism, heat.

General secondary education:

Physics: Motion, Force, energy, Heat, Electricity, oscillations- wave-acoustics, optics, Nucleus and Nuclear phenomena, Electromagnetism

Chemistry: physical properties of materials, chemical changes (atoms, molecules, ions), atmosphere-air composition, soil & subsoil, acids, bases and salts; the periodic table; organic chemistry.

Biology: Cell, photosynthesis, nutrition, respiration, reproduction, organisms and the environment, metabolism, illnesses and related factors, reproduction-continuation of life, genetic engineering and biotechnology, evolution (Lower secondary). Cell, organs, systems, metabolism, genetic material, human organism and health, man and his/her environment, evolution (Upper secondary).

Vocational education: physical properties of materials, chemical changes (atoms, molecules, ions), atmosphere-air composition, soil & subsoil, acids, bases and salts; the periodic table; chemistry of carbon.

Theme 1: **State of affairs-recent changes**

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Wider policy perspectives

In the last three years a curriculum reform has been initiated by the Ministry of Education ("New School") for compulsory education (primary and lower secondary). Currently this is in pilot phase in a number of schools all over the country (about 120).

The main objectives of New School as regards Mathematics and Science are:

- Teachers' active engagement in new forms of didactical design and implementation.
- Teachers' engagement in selection of teaching resources and materials and in particular the exploitation of digital technologies for adding pedagogical value.
- Students' engagement on project work targeting challenge-based learning.
- The spiral development of the content focusing on the idea of learning and teaching trajectories.
- The emphasis on the development of students' competencies and mathematical and scientific literacy in compulsory education.

Science and mathematics teacher education

Initial teacher education

For *primary school teachers*, initial teacher education is offered by the Education Departments.

For discipline specialist teachers for secondary schools, initial teacher education is very limited. Very few Mathematics or Science departments offer courses on Mathematics or Science Education in the context of undergraduate studies.

In order to get a teaching position in public schools *Primary and Secondary teachers* have to succeed in National Examinations. According to a law published recently, in order someone to participate in National Examinations for getting a teaching position, he or she should have a teaching certificate. A diploma acquired from Educational Departments in Universities lead automatically to the acquisition of a teaching certificate for primary

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education. In contrast, if someone has a diploma in Physics, Biology, and Chemistry etc, he or she should also acquire a teaching certificate (to provide proof of pedagogical/didactical studies on the subject area) , in order to be a candidate in the National Exams for a teaching position in a Public Secondary School

When entering the profession primary and secondary teachers attend initial education lectures provided by Special Regional Centers (SRC) for teacher training.

In-service teacher education

There is no systematic in-service teacher education. Teachers can participate in programs organized by the Ministry of Education and local Education authorities or follow post graduate studies in Master Degree programs hosted in Universities.

In the last three years primary and secondary teachers have several opportunities for educating themselves in the general use of digital technologies (Level A) as well as the use of the digital tools in their teaching subjects (Level B - 96 hours course) provided in specific Centres for Teacher Education Support (CTES). Teacher educators in CTES are trained for 350 hours at special courses organized by University Departments called University Centres (UC). The majority of teacher educators in UC are in service teachers at secondary education level. They consider their engagement in teacher education as a means for their professional development.

Implementation in the classrooms

Teaching time

In all grades of Primary school, Mathematics covers 4 hours out of about 26 teaching hours per week. In all grades of Lower General Secondary school, Mathematics covers 4 hours out of about 35 teaching hours per week. In Upper General Secondary school, Mathematics covers 4 or 5 hours out of about 35 hours per week (we refer only to compulsory courses). In Vocational school, Mathematics covers 4 or 5 hours out of about 35 hours per week.

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In Primary school, Science covers on the average 4 hours out of 26 teaching hours per week. In Lower General Secondary school, Science (Physics, Chemistry & Biology) covers from 2 to 5 hours out of about 35 teaching hours per week. In Upper General Secondary school, Science (Physics, Chemistry & Biology) covers from 5 to 6 hours out of about 35 teaching hours per week (we refer only to compulsory courses). In Vocational school, Science (Physics, Chemistry & Biology) covers from 5 to 6 hours out of about 35 teaching hours per week (we refer only to compulsory courses).

There are no foreseen changes.

Methods of teaching

In primary education, emphasis has been given to more informal and mental processes and problem solving. These approaches are supported by the curriculum and the school textbook, and they are adopted by most of the primary school teachers. During the last ten years, newly graduated teachers who have entered the profession have been more flexible in adopting more active teaching methods since they experienced them in their pre-service education. The new curriculum, which has been developed as part of the reform, targets clearly more active teaching methods involving for instance students' project work and integration of technology in the teaching of mathematics and science.

In secondary education (general and vocational), teaching is characterized by more passive teaching methods. This might be due to the following reasons: (a) the majority of secondary teachers had not taken part in any teacher education program during their postgraduate studies, and (b) there is not systematic in-service teacher education at the secondary level. However, teachers who experienced teacher education in the context of a specific program or as part of their postgraduate studies in mathematics and science education tend to adopt more active teaching strategies.

Assessment

In primary education Mathematics and Science assessment, as in all the other subjects, takes place during the school year by written tests and students' classroom work and homework.

In secondary education, Mathematics and Science assessment takes place through (a) a number of tests during the school years (lasting 15 or 45 minutes), (b) students' classroom work and homework, and (c) final exams in the end of the school year.

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At the end of the secondary education, there are competitive national examinations for entry into Universities or Technological Institutes, which traditionally maintains a high status and most pupils are expected to strive for. Students in secondary schools attend a number of common subjects (Mathematics and Science included) but also have to select one of three given specializations (i.e. Theoretical, Technological and Scientific) where extra courses are offered and examined. These courses are examined in the National examinations. Mathematics and Science are two subjects that are included in the two of the three above directions.

All students of vocational schools take a specialization in the last two years of their studies, which leads to a professional qualification. Moreover, they have the option to participate in the national examinations.

Constrains in relation to the aims of the mascil project

The aims of the mascil project are on similar lines with those of the 'New School' reform. However, these aims are not yet realized in the everyday teaching. So, it is a challenge for our group to explore if and how mascil activities can be designed and implemented within our national educational context.

Theme 2: **Schooling and the world of work**

Wider policy perspectives

General education

At the level of general aims, policy-making national documents seem to prioritize the connection between general education and society. These documents stress the importance for students to be able to participate efficiently in their future social and professional activities.

The connection between general education and the world of work is not a priority in Greece.

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Vocational guidance is integrated in general secondary education as one particular subject of the curriculum (this subject is taught only in Lower Secondary general school in grade 9 for 1 hour per week).

There is no evidence in Science and Mathematics curricula in our country of the connection between schooling and the world of work in terms of aims and objectives of science and mathematics education.

Vocational education

Vocational education is present in the Greek Educational system for many years as an alternative for students who want to take a professional specialization through their studies in vocational schools. Up to now vocational education offered a large number of diverse specializations in different domains (health, informatics etc.) but recently (July 2013) due to our current economic crisis the government decided to terminate the existence of particular specializations (e.g. Health, Graphical design etc.). This seems to cause big problems on vocational education and in particular on teachers' motivation.

Issues regarding schools/institutes

Vocational schools in Greece

Vocational schools operate usually during the day but also in the evenings for working students. Studies in the first kind of school last three years while in the second lasts four years. Also there are vocational institutions (OAED) that offer professional specializations with an emphasis in the practical aspects of the professions. These institutions are supervised by the Ministry of Work.

Connections between general schools and industry/informal education

In Greece, Mathematics and Science exist as separate subjects. There is no evidence in our country of the connection between general schools and Industry. Visits to places that can support informal education are organized at all levels of education as an initiative of schools or particular teachers. It is upon teachers to connect these visits with the subjects of Mathematics and Science within their lesson activities.

Connections between general schools and industry/informal education

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At the level of vocational education there is no connection between the school system and the industry. Only the vocational institutions supervised by the Ministry of Work (OAED) offer students a practicum course in industry. There is no evidence of any connections between vocational school system and providers of informal education.

Connections between general and vocational schools

The curriculum of mathematics and science is common for both type of schools, general and vocational schools. Given this, students who finish the first year of the general secondary school have the opportunity to continue their studies to the vocational school and vice versa.

Issues regarding classrooms

Curriculum support materials and assessment in relation to the world of work in general education

There is no evidence in science and mathematics curricula of the connection between schooling and the world of work, both in primary and secondary general education.

There is no evidence in science and mathematics curricula -in relation to assessment- of the connection between schooling and the world of work.

Teaching methods and assessment in vocational schools

In vocational schools the teaching of Mathematics and Science can be primarily characterized as traditional (teacher-centred). Although the syllabus of vocational schools is the same as in general schools, the level that is taught is lower as students in vocational schools are of lower achievement.

In vocational education, Mathematics and Science assessment at school takes place through (a) 15 to 45 minutes classroom tests, (b) students' work in classroom tasks and homework, and (c) final exams in the end of the school year. All graduates from vocational schools take a specialization in the last two years of their studies which leads to a professional qualification. Moreover, students have the option to participate in the national exams leading to University studies or to Technological Educational Institutes by taking extra Mathematics and science courses (called Directions, Technological and Scientific).

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Due to the fact that students in vocational schools have low performance in Mathematics and Science, the final exams of thee subject can be characterized as 'easier' in relation to the corresponding exams in general schools.

Constrains in relation to the aims of the mascil project

Since there are no established connections between school and the world of work in our educational system it is a challenge for our group to explore if and how mascil activities can be implemented within our national educational context and what are the possibilities for a corresponding reform in the future.

Theme 3: **Science and Mathematics curricula and IBL**

Wider policy perspectives

Existing policy making national documents give emphasis to general abilities/skills that are considered as useful for students in order to cope with the challenges involved in their future life at social and professional level (problem solving, understanding of the physical world etc.). Inquiry based teaching and learning approaches are not part of the national curricula. Primary, general secondary and vocational education curricula are structured according to the content. The new curriculum, which has been developed as part of the current reform of New School, prioritizes inquiry based teaching and learning approaches favoring the development of students' mathematical and science literacy. It also prioritizes teaching methods involving students' project work and integration of technology in the teaching of mathematics and science.

Issues regarding schools/institutes

The schools in our country have not been committed to implement any policy priority in relation to inquiry based teaching and learning approaches. However, in the last two years a particular number of primary and secondary schools (about 120) have been selected by the Ministry of Education for the pilot implementation of the new curriculum which has been developed as part of the reform New School. These schools are committed to

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implement the new curriculum for one year and they attempt to use inquiry-based approaches that are supported in the curriculum.

Issues regarding classrooms

The current national curricula are accompanied by a single textbook determined by a Ministry of Education organization called the Institute of Educational Policy (IEP) for each school subject, including science and mathematics. Primary and general secondary textbooks include some open activities targeting students' exploratory stance towards Mathematics and Science. However, they are fragmented within the textbooks and they are not considered by the teachers as involved in the 'official' part of mathematics that is tested in the final examinations. Thus, it depends on the teachers if such activities are implemented in the classroom or not. In contrast, the new curriculum which has been developed as part of the reform New School, is accompanied by rich materials and resources (e.g. exemplary activities, digital resources, scenarios for exploiting digital tools) aiming to support inquiry based teaching and learning approaches. One action of New School, which has been implemented relates to the enrichment of the existed textbooks with digital materials favoring students' exploration and rich meaning generation.

Currently, students' assessment does not draw on notions of inquiry based learning. However, the new curriculum which has been developed as part of the reform New School adopts formative methods of assessment taking into account skills/competencies related to inquire based learning (e.g. expression based on the use of multiple representations, exploration of problem situations, modeling, communication with others, analysis and interpretation of data).

Constrains in relation to the aims of the mascil project

The aims of the MASCIL project are coherent with those targeted by the New School reform. However, it is not yet part of everyday classroom teaching. So, it is a challenge for our group to explore if and how mascil activities based on inquiry based learning can be designed and implemented within our national educational context.

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Theme 4: Pre-Service teacher training in relation to i) IBL and ii) the world of work

Wider policy perspectives

With respect to the preparation of secondary teachers, there is no teacher education certificate. For example, a Bachelor's degree in mathematics together with a "pass" in competitive national written exams is sufficient for employment as a mathematics teacher.

For primary school teachers' the policy priorities training which involves theoretical knowledge for teaching and learning (subjects of pedagogy, theories of learning, psychology) as well as familiarization with the teaching requirements in real school context.

Implementation

Responsible educational structures

Universities and ASPETE (School of Pedagogical and Technological Education) are the main places where pre-service teachers are educated to teach.

Primary Education Departments offer mainly a broad range of educational subjects, neglecting, though, the learning of Science and Mathematics. Their graduates that become primary teachers generally have a strong educational background and narrow pedagogical content knowledge in Science and Mathematics.

Science and Mathematics Departments, on the other hand, focus on the learning of Science and Mathematics and very few of them offer to their students a relatively small number of educational subjects. Thus, their graduates who become Science and Mathematics secondary teachers are mainly educated on the scientific part and less on pedagogical content knowledge.

ASPETE's Departments prepare teachers-engineers for the vocational education level mainly. They can also teach technology in general secondary level. The main part of the program focuses on pedagogical issues. ASPETE is the only Institution that offers a systematic prospective teachers' preparation course for one year to graduates of departments not leading directly to the profession of teaching (e.g. education departments, Mathematics departments).

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Organization and structure, length of training programs

Primary Education Departments' main program lasts 4 years. The number of courses on science and mathematics and science & mathematics education differs from Institution to Institution. Around 15% of the subjects in the program refer to this domain. The majority are subjects in General Pedagogy, Psychology and Sociology of Education. Graduates can teach in Primary schools.

The program in Science and Mathematics Departments may offer in better cases a percentage of 15% pedagogical subjects and courses on Science or Mathematics education. These courses may be optional, that means a graduate can end up without any study on science & mathematics education. In very few Departments a specification in science or mathematics education is offered. Graduates can teach mainly in general secondary education, but in vocational education as well.

Departments of Engineers or Environmental, Agricultural, & Medical Departments do not include any educational subjects in their program. Only some Departments of Informatics may offer a few numbers of computer education subjects. Their graduates can attend a yearlong pedagogical course in ASPETE in order to be able to teach in general & vocational secondary level or for informatics teachers in primary level as well.

Systematic teacher training courses are mainly provided by ASPETE. Till recently, this institution offered courses for graduates of departments not leading directly to the profession of teaching (e.g. mathematics departments), who would like to become teachers mainly in vocational secondary schools. From this year on, courses on pedagogy/didactics on each subject area (mathematics, physics etc) are also offered, for graduates of Science and Mathematics Departments, who would like to get a teaching certificate in order to be able to participate in National Examinations for becoming a secondary teacher in public schools.

People responsible for training

In Universities the courses are delivered by the staff of the Institutions or by part-time hired educators. They hold a PhD or/and do research in relevant area, e.g. science education, mathematics education etc. Sometimes pure scientists or mathematicians, as well as general educators, are involved in teacher training courses.

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People who receive training

Undergraduate students in Departments of Education (aim to teach primary school) and students in Mathematics and Science Departments (aim to teach mathematics and science at general secondary and vocational schools) can receive training.

In order to attend the yearlong teacher education course in ASPETE, prospective teachers submit a CV with their qualifications to be evaluated. A system of evaluation exists, according to which, PhDs, Masters, the knowledge of foreign languages and the use of computers are graded. The prospective teachers who hold a certificate of pedagogical and didactical training can become teachers in vocational secondary schools mainly, but also in general secondary schools and the teachers of Informatics in primary schools as well.

Overall concept of training

The overall concept of the prospective teacher training is that teachers need to become aware of the main theoretical ideas on science & mathematics teaching and to be able to apply this knowledge in real classroom settings. A privileged goal is the emergence of critical-reflective teacher. The world of work is absent in the primary science and mathematics, while only instances of the application of some ideas in real life and workplaces exist, especially in secondary science curricula. Therefore, teachers' training generally does not involve such aspects.

In vocational secondary schools the world of work is more dominant in the school curriculum, as the intention is these students to become professionals. So, the focus of the curriculum is on the study of technological mechanisms, structures and devices related to their profession. However, the integration of Science and Mathematics in their study and how these can be exploited to address real situations is rather limited. The extent to which these aspects are taken into account in teacher training courses depends mainly on the educator, while there are cases even for subjects like 'Didactics', where the course has a general pedagogical orientation.

Teaching methods

The main teaching methods in teacher training courses are structured around linking theory of teaching and learning with teaching practice. They involve expository teaching,

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group work and cooperation with mentors. IBL is embedded in the training occasionally by some educators, who support such approaches. This holds for all the educational levels.

Teachers' voice

Our experience of working with pre-service teachers at different educational levels indicates that in primary education prospective teachers are more willing to adopt IBL approaches while this is more difficult in the case of secondary education.

Constrains in relation to the aims of the mascil project

The present situation in pre-service training can be improved in two directions: To reflect on the efficiency of the pre-service teacher training courses in terms of training approaches; to develop awareness of connecting IBL and the world of work in teaching. So, it is a challenge for our group to explore if and how mascil activities based on inquiry based learning can be designed and implemented within our national educational context in the case of pre-service teacher training.

As far as initial teacher training in the project is concerned, our aim is to introduce pre-service teachers on the integration of IBL and world of work activities in the teaching of Mathematics and Sciences. Prospective teachers will be contacted through the university courses. We also intent to connect school and the world of work by exploiting the material provided by mascil and the material that will be developed by the participant teachers in our own courses and in particular courses related to teaching practice in schools.

Theme 5: In-Service teacher training in relation to i) IBL and ii) the world of work

Wider policy perspectives

Policy priorities for in-service teachers' training

Currently, teachers' professional development is not finalized after their pre-service education since there is a vision for lifelong learning. With respect to in-service education, apart from an initial training before entering the teaching profession there is no systemic

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mechanism or infrastructure for teacher development. However, through the support of the European Community there have been projects informing innovative curriculum reform (New School) and teacher education programs in digital technologies funding for example "Wide teacher education on the educational use of computer and information technology in the teaching learning process 2007-2013".

The teaching profession in the state system is tenured and low paid and no in-service assessment mechanism is taking place up to now. Teaching is inevitably traditional and the teaching profession is perceived as relatively static. In the last 15 years however, the Ministry has been allocating funds for the establishment of Master courses in Education. Furthermore, in the wake of funding for the use of digital technologies, there have been projects funding middle scale teacher education, production of educational software and teaching material. For example, in the last three years primary and secondary teachers had the opportunity for being educated in the general use of digital technologies (Level A) as well as in the use of the digital tools in their teaching subjects (Level B) provided in specific centres of teachers' education support (CTES).

Organization, structure and length of newly appointed teachers' training (induction stage)

State initial training programs of in-service teachers are organized in the 16 Special Regional Centers for teacher training. These are offered to teachers that are newly appointed for teaching in primary or general secondary levels. This is not a permanent service, but alters in terms of different educational policies (e.g. three months duration, or 100 hours). Their structure and exact duration depend on the Government policies. However, the tendency is to include within the course a broad range of subjects, like Psychology, Educational Evaluation, Didactics, etc. Lastly, the structure involves two phases: the theoretical part and the practical part. They are offered for primary teachers and general secondary education teachers.

Implementation

Professional development for in-service teachers is on a voluntarily basis. The educational structures for in -service teachers' training is provided by the Ministry of Education and Universities. Since there is not an integrated teacher education policy, in the following we provide information about the structure of one of the very few teacher education programs on digital technologies that have been implemented in the last three

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years. The teacher educators trained in University centres are appointed to give wide scale (96 h) course to groups of teachers for the educational use of technology. These courses take place in local training centres called CTES in order the Mathematics and Science teachers have easy access to them.

When entering the profession, primary and secondary teachers attend initial education lectures provided by Special Regional Centres for teacher training (see detailed descriptions above). State training courses organized by Special Regional Centres for teacher training employ a range of people: teachers' advisors, experienced teachers with qualifications and University staff. Official criteria do not exist. A PhD degree, the actual experience of the educational settings and classroom teaching are some of the generally accepted criteria. The training courses organized by the Special Regional Centres for teacher training are compulsory for all newly appointed teachers at the primary, general secondary and vocational education level.

There is not an overall well-structured vision for in service teachers' training in our country. There are not topics connecting school and the world of work in in-service teacher training.

The main teaching methods within teaching training courses are structured around linking theory teaching and learning with teaching practice. They involve various teaching methods including expository teaching, group work and cooperation with mentors. For instance, compulsory training in Special Regional Centres for teacher training is directed towards the familiarization of the teacher professional and the school culture.

IBL can be part of particular training courses such as a course in the pedagogical use of technology.

Teachers' voice

Our experience of working with in-service teachers in different settings (e.g., Master's courses, professional development activities) indicates that IBL and connection of school with the world of work is beyond their classroom experiences (especially for the secondary teachers).

Constrains in relation to the aims of the mascil project

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The present situation in in-service training can be improved in two directions: To reflect on the efficiency of innovative in-service teacher training approaches, and to develop awareness of the potential to integrate IBL and the world of work in teaching. So, it is a challenge for our group to explore if and how the mascil activities based on inquiry-based learning can be designed and implemented within our national educational context in the case of in-service teacher training.

Our intention for in-service teacher training in the project is to introduce in-service teachers to the integration of IBL and world of work activities in the teaching of Mathematics and Sciences. The teachers will be contacted through professional channels which can be formal (Ministry of Education, Scientific associations) or informal (e.g. teacher groups, learning communities, e-forums. The selection of multipliers will be based to criteria involving professional qualifications (MA, PhD), experience of participation in professional development courses or in an established learning community, experience in using IBL in teaching and experience in educations. We intent to connect school and the world of work, by exploiting the materials provided by mascil and the materials that will be developed by the participating teachers.

PART 2: EMERGING ISSUES FOR REFLECTION

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Equity specific issues

According to PISA 2009 results for Greece shows that there are statically important differences between boys and girls in science and mathematics performance. In Mathematics, the mean performance of boys is 473 units while in girls is 459 units. In Science, the mean performance of boys is 465 units while for girls it is 475 units. There is no evidence of gender specific issues in policy making documents and the national curriculum for Science and Mathematics. There is also no evidence of gender specific issues in professional development programs.

Addressing low achievement

There is no evidence of low achievement issues in policy making documents in Greece. Some schools offer extra teaching beyond the official teaching hours for low achievement students. This teaching is not obligatory and only a few students participate. There is no evidence of how to tackle low achievement in professional development programs.

Promoting entrepreneurship

Entrepreneurship was not a widely circulated idea in the past. However, it recently has received some attention especially after the economic crisis. Although we do not have any official evidence of how many individuals have the appropriate skills to start a business, informal discussions with experienced teachers on this issue indicated an estimated percentage around 15%.

In our country different activities have been organized from 2005 to 2009 with the aim to promote entrepreneurship. These include summer schools where vocational students were engaged in designing business plans based on their own specialization. Recently, another idea has been introduced in both general and vocational education levels: the ‘career education’. This is a parallel to schooling program, like a project, and it is not obligatory. In this program, the students are encouraged to get some experience on how to make their own business plan. Teachers, irrespective of their specialization, can run such activities on a volunteer basis. Students’ entrepreneurship plans are presented at the end of the year in a special school event.

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Primary teachers and science and mathematics teachers in general secondary schools have no specific experience on the entrepreneurship issue. A group of teachers in Vocational secondary education, who have studied Business Administration, are the only specialists in supporting such an idea among students. Entrepreneurship is not necessarily connected to IBL in Science and Mathematics teaching. The systematic use of IBL approaches, however, could help students to develop skills necessary to entrepreneurship.

Comments by the NAB

An official meeting with Greek National Advisory Board is scheduled after September 2013, therefore comments and validation by the NAB will be provided in due time.

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mascil
mathematics and science for life

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