

Analysis of the Czech policy context

mathematics and science for life



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.



1.10 National Report of Czech Republic

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

Introduction: Organization of education in the Czech Republic

Table 1 summarizes the main educational structure in the Czech Republic. In six columns and five age-groups the basic data and information are provided.

Table 1: Organization of education in Czech Republic

Grade	Age	Disciplines ¹	Type of school ²	Type of teachers ³	Initial training ⁴
-3 – 0	3 – 6	Pre-primary science with environmental accent (One)	Kindergarten/ Nursery	G – Pre-primary teachers	B.A. (+3) or M.A. (+5) in Pre-primary Pedagogy, exceptionally Pedagogical High school (Uni or Pedagogical High School) (ped.) (Dida)
1 - 5	7 – 11	Maths and Primary Integrated Science (M & S)	First stage of nine-years basic (elementary; primary) school	G – Primary teachers (for all subjects)	M.A. (+5) Teaching at first stage of Basic (elementary; primary) School (Uni) (ped.) (Dida)
6 - 9	12 – 15	Separated Maths (6 - 9, Physics (6 - 9,	Second stage of nine-years basic	2D – Teachers for second stage	M.A. (+5) Teaching at second stage of

		Chemistry (8 – 9) and Biology (6 – 9) (M & S3)	(elementary; primary) school or first stage of eight-year high school (gymnasia)	of basic school	Basic (elementary; primary) School – double major subjects combination (f.e. Ma-Phy, Bio-Che, Phy-Che etc.) (Uni) (disc.) (Dida)
10 - 13	16 – 19	Separated Maths, Physics, Chemistry and Biology (M & S3)	High school (for-years, gymnasia) or second stage of eight-year high school (gymnasia)	2D – Teachers for middle schools	M.A. (+5) Teaching at middle school – double major subjects combination (f.e. Ma-Phy, Bio-Che, Phy-Che etc.) (Uni) (disc.) (Dida)
10-12(13)	16 – 18(19)	Separated Maths, Physics, Chemistry and Biology or integrated science by type of specialisation (M & S or M & 3S)	Vocational upper sec. schools, Vocational schools	2D – Teachers for upper secondary schools or 1D – Professionals with additional pedagogical qualification	M.A. (+5) Teaching at middle school – double major subjects combination (f.e. Ma-Phy, Bio-Che, Phy-Che etc.) or M. A. in branch with additional pedagogical qualification (+1 – 2) (Uni) (disc.) (Dida)

The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.



1. Maths and sciences not separated (One), maths and integrated sciences (M & S) – 2 or 3 subjects in sciences (M & S2 or M & S3) or just one type of sciences Bio or Phys (M&Bio – M&Phys)
2. Nursery, primary, upper-primary, lower secondary, upper secondary, vocational
3. Generalist G, 2 disciplines specialists 2D, mono-discipline specialists 1D, nD, 2/1D...
4. Number of years in tertiary education of training (+n), type of institution (Uni, PHS – Pedagogical High School) Discipline (disc) or pedagogy (ped.) orientated, courses in Didactics (Dida)

Theme 1: State of affairs-recent changes

Currently, the reform of the education system has been running in the Czech Republic. The process started on the pre-primary level in 2005, continued on striking primary schools and secondary schools; currently reaching vocational schools. Improvements which resulted from the reflection on pre-primary, primary and secondary levels are being implemented in the education system. In four bullets below main characteristics and changes are described which focus on science and maths education. In some cases changes are difficult to be understood or explained, in other one they are highly required and appreciated. The changes relate to wider policy perspectives (macro level), school level (meso-level) and classroom level (micro-level). Unfortunately, the Czech concept hardly contains ideas and tools useful for MASCIL and thus we can hardly expect potential implications for the work of MASCIL, we hope to make efforts and implement MASCIL results to the Czech system are to be considered.

Wider policy perspectives

Support to Science and Maths on all stages of education is mainly given in ESF development projects. In curricular documents the call for inquiry-based methods have appeared, but only generally mentioned for the time being. In last five years the curricular structure is being under development and re-construction on all stages (levels) of the educational system. The two-stage concept has been introduced – Framework Education Programme (the state level) and school education programme (school level). The recommended learning content is structured in wider fields that single subject are, which enables creative approaches (independent subjects, integrated subjects etc.). Maths is

structured under “Maths and its applications”, natural sciences (Phy, Che, Bio and also Geography) are included in the “Man and Nature” field. Changes in the way science and mathematics education are mentioned as evident in national policy making documents and in the national curricula (<http://www.msmt.cz> – Ministry of Education, <http://rvp.cz> – School reform supporting portal). Reference content is structured according to levels: primary education, general secondary education, vocational education.

Science and Mathematics teachers’ education

Resulting from the Bologna declaration, the originally 5-year master teaching study programs (double major subjects) were divided in 3-year bachelor (B.A.) and two-year follow-up programs (M.A.). All programs are traditionally oriented in double major subjects, no changes were applied and none are expected. No changes were made in the Teaching at primary stage school program (five-year M.A.).

Implementation in the classrooms

Currently, changes are declared in teaching methods towards IBSE but the real educational conditions are changing slowly on all education levels. The ICT are implemented to a large extent (interactive boards, instrumental methods). No changes in relation to the ways how science and mathematics are assessed have recently been implemented.

Constraints in relation to the mascil project

The main constraint is the changes are only theoretically declared in documents, e.g. the application of teaching methods towards IBSE. Teachers are motivated (mainly by grants) towards preparing learning materials applying IBSE, implementing the ICT and inductive approaches in lessons.

Theme 2: Schooling and the world of work

As pre-defined in mascil, the main aim of the project is to promote a widespread use of inquiry based science and mathematics teaching in primary and secondary schools, with a main emphasis on connecting IBSE in school and the world of work. Below we add information on both the general education and its connections to the world of work, and the vocational education. Three levels are to be considered: the macro-level in terms of

*The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.*



policy orientation, the meso-level in terms of schools/institutions and micro-level as far as 'how things are' in classrooms.

Wider policy perspectives

New curricular documents for primary and lower secondary education include the field of "Man and world of work". The relation to work is supported by adding this learning content to Phy, Che, Bio on the secondary level. The vocational guidance is not a separate subject in the curriculum; rather the interdisciplinary character is applied on both the primary and general secondary levels. Competences for the field of "Man and world of work" are explicitly defined. Lately, the little interest of pupils has been detected, mainly in 3-year vocational fields (without school leaving exam).

Issues regarding schools/institutes

Approximately 180 study fields (programs), either as 4-year vocational schools finished by school-leaving exam, or 3-year vocational schools not finished by school-leaving exam are provided by the Czech education system. Maths is separate subject and Sciences are mostly taught in one subject (but this does not mean the integrated approach, but joint learning content and lessons of Phy, Che, Bio). Only sporadic relations to industry appear, mostly in the form of joint projects or sponsoring (funding), both in the field of formal and informal education. There exists a direct relation between the vocational schools and industry (e.g. Škoda, Siemens, etc.) and between the general secondary schools and industry (mostly in the form of joint projects or excursions).

Issues regarding classrooms

Regarding classrooms, the evidence in science and mathematics curricula of the connection between schooling and the world of work in terms of content has not been applied to sufficient extent. Assessment of skills/competences in science and mathematics in relation to the world of work in general education has been developed to a low degree only. Active methods are rather applied as predominant teaching methods in vocational schools in professional subjects. Regarding the nature of students assessment in vocational schools, mostly traditional approaches, i.e. evaluation on 5-level scale (1 – excellent, 5 - failed), are applied on all levels.

Constraints in relation to the aims of mascil

The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.



There exist numerous, still unknown constraints in relation to the aims of mascil project. We expect that innovations in Maths and Science will have a direct effect; they are highly required, mainly by focusing on IBSE and practical examples. For more info see <http://www.nuov.cz> (National Institution of Technical and Vocational Education (NUOV)).

Theme 3: Science and Mathematics curricula and IBL

As expected in mascil, curricula should be reviewed in the scope of the extent to which they prioritise science and mathematics education, as well as IBSMT approaches. The review of the curricula have been done to wider extent in documents but to little extent in real lessons, and the same mini-changes have been done on all three levels (in a macro-level in terms of the aims, objectives, content and expected outcomes as envisioned by the policy makers, the meso-level that regard how schools and institutes mediate the implementation of the policies, and the micro-level that regards the implementation in the classrooms.

Wider policy perspectives

Inquiry based teaching and learning approaches are prioritized in policy making national documents on general level only, without concrete explanation and comments in examples and expected competences. Consequently, the national curriculum prioritizes inquiry based teaching and learning approaches, in general and in specific in science and mathematics subjects, on primary, general secondary and vocational education, but unfortunately, rather on general level, without concrete explanation and comments in examples and expected competences.

Issues regarding schools/institutes

The extent to which schools implement policy priorities in relation to inquiry based teaching and learning approaches is not large, in general and in specific in science and mathematics education on all levels; many schools only start - from projects focused on innovations in instruction.

Issues regarding classrooms

*The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.*



Regarding classrooms there is only a little extent up to now, to which there exist curriculum support materials for science and mathematics education that support inquiry based teaching and learning approaches. Materials are mostly outcomes of projects focused on innovations in instruction. The pioneering is a new set of Maths textbooks for lower secondary education. As for the nature of students' assessment in relation to inquiry based teaching and learning in science education, there exist hardly any, there are minimum exceptions based on individual activity of progressive teachers.

Constraints in relation to the aims of mascil

The initial phase of curricular changes might have a direct effect in the completion of the mascil project, but on the other hand The mascil project thus will contribute to the changes in a large extent, mainly the contribution to innovation of the competence framework of the currently re-formed curriculum of the general maths and science education focusing on increasing the science literacy and application scientific cognitive methods.

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

Wider policy perspectives

Despite it is the first step only, the main policy priority for prospective teachers' training was the fact that the teachers' training in IBL has started. Being declared in educational documents on all levels, the reality was different.

Issues regarding schools/institutes

Universities and Accreditation Commission evaluating of concerned study programmes are the educational structures responsible for the implementation. Double major subjects M. A. qualification for secondary teachers (approx. 40 % for each subject and 20% for common base – pedagogy, psychology, ICT etc.). Universities and Accreditation Commission (section for Pedagogy, Psychology and Kinantropology in cooperation with concerned professional section) evaluating of concerned study programmes are responsible for the training. Pre-Service teachers who receive training, were accepted for university study after graduating from upper secondary schools, i.e. they successfully

*The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.*



passed the school leaving exam. Overall concept of prospective training includes both the theoretical background and topics connecting school and the world of work, on all levels of the education system. The main teaching method is active learning; the IBL is on start point.

Issues regarding classrooms

Pre-service students of maths and science make efforts to apply IBL in lessons but they often meet with little understanding from experienced teachers who guide them in the initial phase of their teaching career. Those consider IBL to be follow-up phase applied after the traditional way of teaching, i.e. when the “firm” knowledge structures are developed. The focus on the world of work is expressed in connection to common everyday problems and information and communication technologies.

Constraints in relation to the aims of mascil

A large contribution is STILL EXPECTED for concrete innovations of teachers' preparation. Our intention for initial teacher training in the project, for facilitating WP 8 and WP10 are in the field of further education, using Web-portals and dissemination of materials.

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

Wider policy perspectives

Teachers' professional development is not finalized after their pre-service education; there is not only a vision, but first steps towards lifelong learning – which is not compulsory but it is positively reflected in salary increase (which is not automatically, but the headmaster makes the decision to increase it, or not). There are no specific references in relation to the induction stage.

Issues regarding schools/institutes

The professional development for in-service teachers is voluntary in the Czech education system. Universities and pedagogical centres managed by the Ministry of Education (and in last year private educational companies with accreditation from Ministry of Education)

are the responsible structures. Regarding the organization, structure, length of training programmes, teachers' training courses of various content and extent are provided by the Ministry of Education and local authorities, for teachers working on all school levels. Universities and pedagogical centres managed by the Ministry of Education and in last year private educational companies are responsible and provide the training. Courses and other educational activities (workshops, conferences, summer schools etc.) need accreditation from Ministry of Education. If interested, all in-service teachers can receive the training – their interest is the only criterion. Overall concept of training covers topics connecting school and the world of work, to a limited extent. The active method in relation to the own practice is the main teaching method.

Issues regarding classrooms

In-service teachers mostly have in mind what IBL means, there exists the Czech term, and how it relates to widely used and applied methods, mainly to problem and project instruction. But they rarely apply IBL, usually as the follow-up phase after the traditionally led instruction or when working with gifted learners. They are interested in further education in the IBL field and they would appreciate if these courses became part of professional and career development (attestation, certification). All respondents from different type of schools in our small survey (n = 8) attended various courses within further education system, focusing mainly on financial literacy, ecology, new topics and trends in their subject/field, ICT implementation in teaching their subject/field etc.

Constrains in relation to the aims of mascil

There are two main constrains in relation to the aims of the mascil project that have a direct effect in the completion of the mascil project: (1) Pushing the idea of the system of further education; (2) A system of teachers' further education in Maths and Science oriented to IBL has not been designed (created).

PART 2: EMERGING ISSUES FOR REFLECTION

*The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.*



Equity specific issues

Reflecting all the above mentioned by the mascil Project, in the Czech Republic (CZ) the significant difference was detected in PISA results (2009), in OECD countries it is in average 39 points in favour of girls, in CR it is even 48 points in favour of girls.

Gender specific issues are NOT prioritized in policy making documents and the national curriculum in the Czech education system, your country. Nothing relating to this topic is explicitly expressed in the Maths and Science curriculum the CZ. The situation resulted from a long tradition, so no national policies for tackling gender differences in learning science and mathematics and for tackling gender inequalities are required.

The gender specific issues are part of teachers' professional development - mainly in the group of pedagogical and psychological subjects, which cover approx. 20 % in teachers' preparation. The training in IBL approaches takes into consideration gender differences in terms of interests, learning styles, motivation, on all school levels.

Addressing low achievement

No groups showing significant low performance have been identified in the Czech Republic, except of the above mentioned gender differences and children with special cognitive disabilities. Generally, the PISA data are not frequently used in the Czech Republic.

Low achievement issues are prioritized in policy making documents and the national curriculum in your country. Low achievements in science and mathematics education were tackled and solved - the curriculum was extended and specifications of children with special needs were added.

Teachers' professional development cover issues on how to tackle low achievement in selected chapters from general pedagogy and partly in field didactics focusing on a subject in question.

Promoting entrepreneurship

*The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.*



Percentage of individuals who have the appropriate skills to start a business in your country (Rethinking education document) is approx. 20 % (in our opinion). But this is a subjective shot, not supported by any sociological survey. According to Czech mass media, about 20 % in work-age people are active in the entrepreneurial sphere.

The entrepreneurship education is declared in main curricular objectives (trends) on all levels of the education system but the concrete implementation is missing. The positive trend is the support of implementation of project instruction, excursions to entrepreneurial sphere etc.

Explicitly professional development and training has been provided to teachers neither in the content covering issues on entrepreneurship education, nor in training in IBL approaches including aspects of entrepreneurship education; instead of the emphasis on project instruction.

Comments by the NAB

The NAB members in discussions on the above mentioned topics and problems agree with our evaluation of the current curricular state in the Czech Republic. They confirm in-service teachers' interest in further (lifelong) education, including IBL, but they consider the practical application in deeper changes of the whole education system, including a reduction of the learning content and its orientation to methodological aspects of instruction, i.e. the formative view on education (learning to learn, apply critical thinking, solve everyday problems relating to the world of work) etc.

*The project mascil has received funding from the European Union
Seventh Framework Programme (FP7/2013-2017) under grant agreement n° 320693.*



Project Information

Project no. 320693
Project acronym: mascil
Start date of project: 01/01/2013
Duration: 48 months
Project title:

mathematics and science for life

Dissemination level

Thematic Priority: Science in Society
Funding scheme: FP7

Information about the deliverable

Deliverable N° 2.1
Due date of deliverable: Month 9
Actual submission date: 04/10/2014
Deliverable title:

Analysis of the Czech policy context

Excerpt from the Deliverable No. 2.1 “National working papers on analysis of policy context”

Contact Information

Coordinator: University of Education Freiburg, Prof. Dr. Katja Maaß
Lead partner for this deliverable: Foundation for Research and Technology, Dr. Kathy Kikis-Papadakis
Website: www.mascil-project.eu



The mascil consortium grants the permission to distribute the licensed materials under the Creative Commons Attribution-Noncommercial-Share Alike license as described at <https://creativecommons.org/licenses/by-nc-sa/4.0/>

