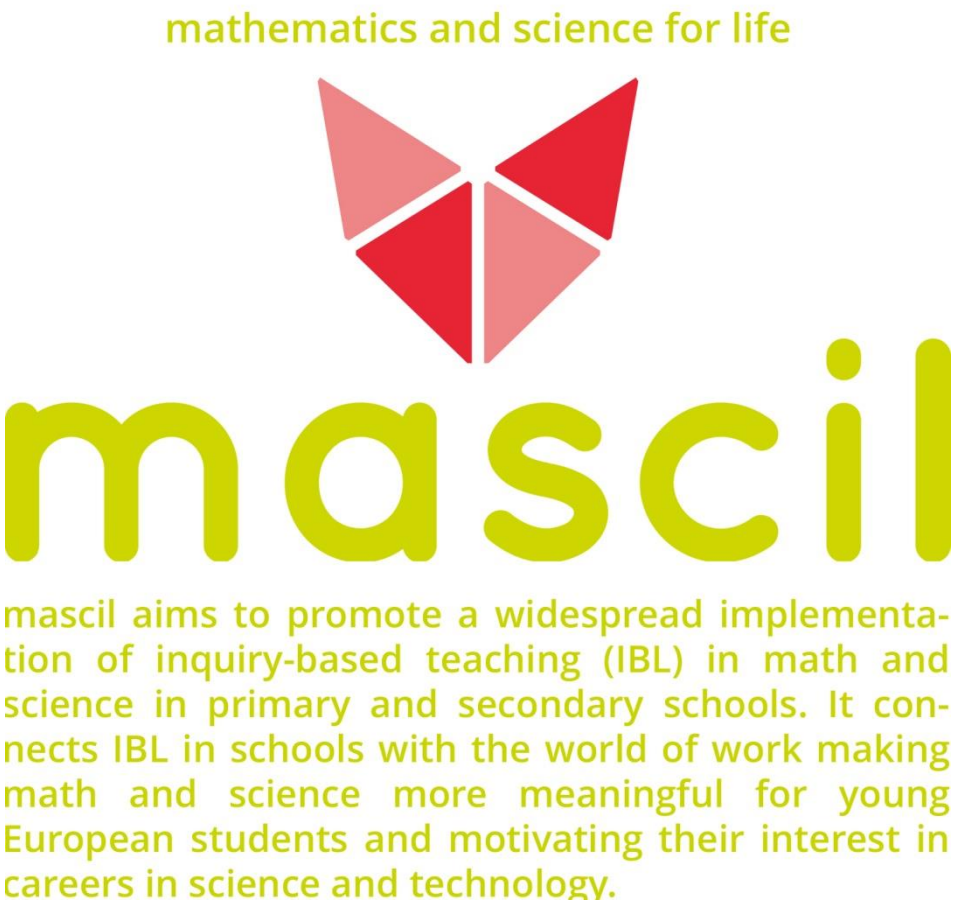
mascil
mathematics and science for life

National policy paper: Norway

"National policy paper on issues and strategies for IBST"



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National policy paper: Norway

Excerpt from the Deliverable No. 2.3 "National policy papers on issues and strategies for IBST"

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1. INTRODUCTION

1.1 Overview of work package 2

WP2 aims to give insights into the strengths, weaknesses, opportunities and threats of Inquiry Based Science and Mathematics implementation from a context perspective. Second, the activities in WP2 focus on cooperation and synergies among research, policy and practice fields, producing strategies to support the more widespread uptake of inquiry-based science teaching (IBST). National working papers on analysis of policy context report on the educational systems and the policy contexts in all 13 partnership nations. They also highlight the contextual factors that support or hinder a widespread implementation of inquiry based science teaching (IBST) in vocational contexts.

In Norway there is a general supportive context for the implementation of the project and for the achievement of the mascil objectives. In relation to wider policy perspectives, policy documents state that the connection between schooling/teaching and industry should be strengthened, and teaching should be made more relevant for students. Priority is also given to inquiry-based methodology both in sciences and mathematics. At a school and classroom level though, it seems that teachers find it hard to adjust to the propositions (see Deliverable N° 2.1, mascil).

Norwegian teachers see time as the main hindrance for implementation of IBST[1] and World of work (WoW)-related approaches: «*To facilitate the increased use of IBL strategies, teachers believe that they need more, and more relevant, continuous professional development courses….teachers need to be given more time to implement IBL in their classrooms and more time to collaborate with their colleagues*». Results from the mascil pre-questionnaires (N=103) show that 49,5 % of the teachers feel confident with IBL whilst 50,5 % don't, 72,8 % say there is too little time available to plan and prepare IBL lessons, and 95 % say they would like to implement more IBL practices in their lessons. Concerning WoW related approaches 94 % of the teachers say that students like them, but only 27,5 % feel confident working with them. 87,2 % would like to make more connections to the WoW in their teaching, but 79 % mean there is too little time available to plan and prepare WoW related lessons.

The content of this national policy paper revolves around the question as to what can be done on national/international level to motivate policy to support the widespread implementation of IBST.

[1] Sikko, S.A., Lyngved, R. & Pepin, B. (2012) Working with Mathematics and Science Teachers on IBL Approaches: Teacher Concerns. *Acta Didaktika Norge, Vol 6(1)*: 118/18.

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1.2 Summary of national policy paper

The Norwegian mascil policy workshop “Mascil Building Bridges” was held in Trondheim February 27th, 2015. This was a follow-up event of a similar workshop held in Trondheim January 20th, 2014 (in collaboration with the EU project INSTEM). The two seminars were entitled “Building Bridges”, referring to the need for connecting the European projects in science and mathematics education at the national level. The mascil Building Bridges event was hosted by Sør-Trøndelag University College (HiST) - see attachment 1 and 2.

The seminar was administered by the mascil team at HiST, Professor Birgit Pepin, HiST/Einhoven (Norwegian coordinator of PRIMAS and mascil) and Professor Peter van Marion, Norwegian University of Science and Technology (NTNU) (Coordinator of S-TEAM, Norwegian coordinator of INSTEM).

The list of participants (see page 4-5) includes researchers in science and mathematics education, teacher educators, school teachers, persons representing school owners (Trondheim Municipality, Sør-Trøndelag County), the Norwegian Centre for Mathematics Education, the Norwegian Centre for Science Education, the National Centre for Science Recruitment, the Ministry of Education and Research and national initiatives/projects like FYR[2], Lektor 2[3], Rollemodell[4]. In addition Peter Gray, INSTEM, and Geoffrey Wake, mascil, were invited guest speakers.

The aim of the policy workshop was to discuss teacher education, professional development and development of the profession, with regard to mathematics and science education; and the use of Inquiry Based Science Teaching and World of Work approaches. The program of the seminar is given in attachment 3.

The main outcomes were: we managed to consolidate the importance of IBST and WoW approaches amongst the teacher education community; to disseminate the importance of such approaches to school and government authorities; and emphasise the important role mascil plays in this. In particular, we were able to engage the Norwegian Ministry of Education and Research through their representative at the workshop, we improved the connection between HiST and the Ministry; and we established a vision for more cooperation and alignment of projects with IBST and/or WoW approaches and discussed the opportunities for sharing resources.

[2] http://fyr.ndla.no/
[3] http://www.lektor2.no/
[4] http://www.rollemodell.no/

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2. APPROACH AND METHODOLOGY

2.1 Rationale for selection of policy makers

Process of planning
Mascil Building Bridges 2015 was a follow-up event of Building Bridges 2014, and the two workshops represent a local and national long-term plan for strengthening collaboration between projects geared towards IBL. The policy workshop was planned in cooperation with INSTEM, NTNU. During planning, we decided to invite the same policy makers that participated in the previous event, and to add those related to world of work (industry, recruitment centres, initiatives like FYR, Lektor 2, Rollemodel). To have maximum impact on policy makers and motivation for participation, the dean of the Department for Teacher and Interpreter Education, HiST, sent out the invitations. Another strength was that we involved a guest speaker, Geoffrey Wake, School of Education, Univ. of Nottingham, who has been known to be especially experienced in teacher professional development and policy related issues. Peter Gray, Research manager from NTNU, project manager of S-TEAM and leader of S-TEAM WP10 was also invited because of his experiences in working within Educational Policy, Science Education and Pedagogic Theory. Dr Gray has been involved in European collaborative projects and teacher education since 2002 and he is co-convenor of the Teacher Education Research Network of EERA.

In addition to the participants suggested by the mascil team at HiST, INSTEM Norway and the dean at HiST had also suggested a variety of participants. In total there were 23 participants at the workshop. Since policy makers and school leaders usually are busy, we decided to send out invitations as early as possible; about 2 months ahead of the event.

The policy workshop provided an opportunity to discuss a long term plan for the region, to strengthen the collaboration between projects with similar goals, to establish better contact with our Ministry, local and regional authorities, and to increase policy makers' focus on science and mathematics education, in particular the implementation of IBL and WOW related approaches in these important subjects. One possible threat regarding the planning and implementation was the limited involvement of local school authorities, and thus too little involvement of principles/head teachers (1 out of 13).

Networking process, stakeholders' engagement
National centres (math, science, recruiting to sciences) were represented, and so were the Norwegian Ministry of Education and Research (KD), Sør-Trøndelag County, Trondheim municipality, and 1 head teacher. Even though the intention for the 2015 policy workshop was to build on the previous workshop in 2014, we experienced a lack of continuity. Some participants from the Building Bridges 2014 workshop were unable to attend this year's workshop, including representatives from the Directorate for

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Education and Training, and both the Ministry and the county sent new representatives. At any given time there were several projects fighting for attention, so building stable and solid connections to important parts of the political authorities at all levels must be seen as an important future task. In that way it would be easier for those people to see the importance of attending workshops like the Building Bridges event.

2.2 Rationale for selection of specific issues for discussion

Outcomes from Building bridges 2014 were taken into consideration when issues for discussion for the 2015 event were selected. The points of view that were expressed in last years' event are presented below:

1. The nature of inquiry – or inquiry-based learning in science and mathematics
2. "Inquiry" is more clearly present in the curriculum for science than in mathematics
3. Inquiry-based science education (IBSE) alone is not the answer. Improving classroom practice is more a question of being reflective as a teacher
4. The importance of subject knowledge and didactic knowledge in inquiry-based approaches
5. The basis for educational change should be laid in pre-service (initial) teacher training and through empowerment of those teachers already working in schools.
6. A need for collaborative networks
7. Continuous input for teachers: life-long-learning
8. European projects may only reach out to a few teacher trainers and teachers
9. Teacher trainers need to be trained
10. Valuable input through EU-projects
11. Knowledge from EU-projects

Based on reflections around these 11 themes/concerns, our issue for discussion was: *What can be done on national level to motivate policy to support the widespread implementation of IBST?*

2.3 Implementation of national policy workshops

Invitations were sent via email in December 2014, and 23 out of 48 invited persons attended the workshop. The workshop was arranged as a ½ day meeting at HiST, 27th February 2015 at 9.30-12.30. The second half of the day a NAB meeting was held. Presentations were provided by the mascil team and the invited guest speaker Geoffrey Wake. Group discussions organised in mixed groups (see colour coded list of participants, attachment 3) and a plenary discussion towards the end, which mainly consisted of presentations from the group work. The plenary was tape-recorded and pictures from the event were taken. The policy workshop was arranged as a face-to-

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face meeting, which presupposed that people had to be physically present. Those who couldn't travel were not able to attend. It was presumed that in face-to-face meetings it would be easier to get to know each other, to engage and discuss actively. Below is the final list of participants.

List of participants

NAME		INSTITUTION
1. Peter Gray	Research Manager	Norwegian University of Science and Technology
2 .Geoffrey Wake	Associate Professor	School of Education, Univ. of Nottingham
3. Lene Oftedal	Senior advisor	Norwegian Ministry of Education and Research
4. Inger Sagen Hasselo	Principal	Trondheim Municipality, Saupstad school
5. Kjersti Wæge	Director	Norwegian Centre for Mathematics Education
6. Peter van Marion	Professor, director	Norwegian University of Science and Technology, Skolelaboratoriet
7. Per-Odd Eggen	Associate Professor	Norwegian University of Science and Technology, Skolelaboratoriet
8. Ingeborg Ranøyen	STEM-Coordinator	Trondheim Municipality
9. Morten Sørlie	Advisor, Project leader	National Centre for Science Recruitment, Rollemodell and hvakanjegblimedrealfag.no
10. Borghild Lundeby	Director	National Centre for Science Recruitment
11. Tarjei Joar Moen	Advisor, Upper secondary educ.	Sør-Trøndelag County
12. Kristine Bakkemo Kostøl	Project leader, Lektor 2	Norwegian Centre for Science Education
13. Berit Reitan	National Project leader	Norwegian Centre for Science Education FYR science
14. Jens Arne Meistad	National Project leader	Norwegian Centre for Mathematics Education, FYR mathematics
15. Ingrid Næss	Teacher	Trondheim Municipality, Sunnland school
16. Camilla Normann Justnes	Teacher	Trondheim Municipality, Saupstad school
17. Camilla Trud Nereid	Dean	Sør-Trøndelag University College (Teacher education)
18. Birgit Pepin	Professor	Eindhoven School of Education, Eindhoven University of Technology / Sør-Trøndelag University College
19. Heidi Dahl	Associate Professor	Sør-Trøndelag University College (Teacher education)
20. Maria I. M. Febri	Associate Professor	Sør-Trøndelag University College (Teacher education)
21. Jardar Cyvin	Associate Professor	Sør-Trøndelag University College (Teacher education)
22. Svein Arne Sikko	Associate Professor	Sør-Trøndelag University College (Teacher education)
23. Ragnhild Lyngved Staberg	Associate Professor	Sør-Trøndelag University College (Teacher education)

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2.4 Problems/issues arisen during the implementation

The first issue raised was the importance of continuity. It was therefore decided to include the coordinators of the Building Bridges 2014 workshop in the planning of the 2015 meeting. This would also ensure the participation of related EU-projects, since the 2014 meeting was a collaboration between mascil and INSTEM and S-TEAM.

An important issue arising during the implementation of the policy workshop was the participation of important policy stakeholders and school authorities. As different projects (and their leaders) were present at the event, it was necessary to build good relations with influential key people who might help involving the relevant policy makers. At HIST, the dean Dr. Camilla Nereid was such a key person, and fortunately she agreed to help with the invitations and arrangements of the workshop.

Teachers are key stakeholders in the implementation of new ideas and pedagogies in school, and to ensure teachers' willingness to engage in professional development, it is mandatory to engage school owners and head teachers. It was therefore decided to invite relevant key persons at local and district level to the workshop as well as head teachers. Unfortunately, it turned out that fewer of these people than we would have wished were able to attend the workshop.

3. DOCUMENTATION OF THE WORKSHOP

3.1 Themes and issues discussed

The expected outcome of the discussion during the national policy workshops revolved around the overarching question: *What can be done on national/international levels to motivate policy to support the widespread implementation of inquiry-based science teaching?* From this question, we derived the following questions for group discussion:

- In which ways can policy makers, teacher educators and schools/teachers work together more closely, in order to get the most benefit from projects like mascil?
- In which ways are projects like mascil useful for schools and teachers?
- What are the benefits for Norway: what are the 'lasting benefits'/what is the 'lasting impact' of projects like mascil, in terms of
    - Professional development of mathematics and science teachers and the scaling of the professional development?
    - IBST?
    - Linking schooling (e.g. subjects) and the world of work?

The results of the discussion are presented below.

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3.2 Recommendations

The main outcomes of the group discussion in the policy workshop were connected to

- the importance of establishing and maintaining professional networks and structures at different levels: Within-school, between-schools and between-projects level;
- the importance of vision alignment at those levels, and
- the roles both national and local policy makers play

At within-school level, we have gained insights into the positive impact of IBST on students' learning of mathematics and science. Teachers and multipliers involved in the mascil project and other related projects promoting IBST, through the professional development, report that they have learnt how to reflect and share/communicate with each other, in order to spread the implementation of IBST to all mathematics and science teachers in the collegium. From the policy workshop, *the crucial role teacher networks within school play in order to sustain the implementation of IBST beyond the project's lifetime* became clear. For this to happen, it is important that school leaders are knowledgeable about the implementation and its processes, and that teachers receive continuous support both from school leaders (head masters) and from local policy makers (County, municipality). Such support can be provided, for instance, by providing adequate amount of time (see § 1.1.) and by facilitating/promoting/ encouraging the development of such communities of practice in every school.

We have also gained insight that this work involves deep and long term cultural changes in schools. It is thus *highly beneficial that schools work in collaboration with other schools*. Therefore the importance of the professional networks at between-schools level or communities of schools. At this level there is the need for policy makers, both local and national, to play a more active role in providing structures and incentives. An example for this is to establish a system of 'expert teachers' in individual or communities of schools. Further, it would also be highly beneficial to closely align the vision of local and national policy makers to the widespread implementation of inquiry-based science teaching.

In order to make the alignment of vision more clear, it is important *that policy documents support inquiry based science teaching*, for instance IBST should be made more explicit in the curriculum and other strategic documents. As importantly, it is crucial to establish an assessment system that is related to IBST. The national policy makers are thus expected to play a significant role in this regard.

Further, the importance of *IBST and WoW approaches should systematically be included and consolidated in the initial teacher training*. New teachers equipped with this

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competency can implement the idea, work with it throughout their career and/or become 'expert teachers'. To implement this at a national level, policy makers at all levels need to play a more active role in supporting the facilitation at national, regional and school level.

This policy workshop was a follow-up of the "Building Bridges" seminar in 2014 motivated by the need for connecting the European projects in science and mathematics educations at the national level (see § 1.2.). One of the important outcomes of the workshop was that we *established a vision for strengthening professional networks between European projects with IBST and/or WoW approaches*, thus more cooperation and alignment across these projects in Norway, including mascil, for instance through sharing of resources. Such alignment will be strongly beneficial for long lasting and widespread impact of European projects such as mascil.

4. SUMMARY AND CONCLUSION

The Norwegian Policy Workshop 2015 took place in Trondheim on February 27th with a total of 23 participants, including representatives from local, county and national level school authorities, national centres for mathematic, for science and for science recruitment, national mathematics and science educational initiative projects, researchers in science and mathematics education, and school teachers. The workshop was a follow up to the 2014 Building Bridges, and thus was in line with the explicit goal of the Norwegian mascil team to build and sustain continuity amongst colleagues working in teacher education and school stakeholders and policy makers on the issues of IBST.

An important outcome of the workshop was the consolidation of the importance of IBST and WoW approaches amongst the teacher education community, dissemination of the importance of such approaches to school and government authorities and the underlining of the important role mascil plays in this. In particular, the participation and engagement of the Norwegian Ministry of Education and Research through their representative at the workshop, was an important outcome.

Furthermore, the establishment of a vision for more cooperation and alignment of projects with IBST and/or WoW approaches, was an important outcome; in particular regarding opportunities for sharing resources across and between projects and the national centres.

For IBST and WoW approaches to become an integrated part of teaching in mathematics and science, a 'culture change' appears to be necessary. Such change relies on the active participation of the communities of teachers in schools. This can only be accomplished through the active facilitation by school authorities at all levels, by

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providing the necessary resources, not least by setting off adequate time for teachers to engage in professional development and collegial communities of practice.

The way subjects are taught in school is to a large extent dependent on what is assessed in exams. To advance the uptake of IBST and WoW –related approaches, it is therefore essential that the national curricula and examinations acknowledge and reward inquiry as an important part of what constitutes knowledge in the mathematics and science subjects.

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ATTACHMENT 1: Photos from the Norwegian Policy Workshop

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ATTACHMENT 2: Photos from the Venue

Venue: HiST, Handelshøgskolen, Klæbuveien 72, Room ELG-U33

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ATTACHMENT 3: Flyer, Norwegian National Policy Workshop

Velkommen til policy workshop: Mascil Building bridges

Tid: Fredag 27.februar kl. 09.30-12.30
Sted: HiST, Handelshøgskolen, Klæbuveien 72, Rom ELG-U33

Program

09.30	Velkomst v/ Camilla Trud Nereid, dekan, HiST, ALT Introduksjon til dagens workshop og *mascil* prosjektet v/Ragnhild L. Staberg. Kort presentasjon av deltakere
09.45	Teacher professional development & development of the profession v/ Geoffrey Wake, Associate professor in Mathematics education, Faculty of Social Sciences, School of Education, Univ. of Nottingham
10.30	Påfølgende diskusjon v/ Doris Jorde, direktør, Naturfagsenteret
10.45	Pause
11.00	Gruppediskusjoner
11.45	Presentasjoner, syntese i plenum v/Birgit Pepin, professor i matematikkdidaktikk, Eindhoven/HiST
12.30	Lunsj

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SPØRSMÅL TIL GRUPPEDISKUSJON

- In which ways can policy makers, teacher educators and schools/teachers work together more closely, in order to get the most benefit from projects like MaSciL?
- In which ways are projects like MaSciL useful for schools and teachers?
- What are the benefits for Norway: what are the 'lasting benefits'/what is the 'lasting impact' of projects like MaSciL, in terms of
    - Professional development of mathematics and science teachers and the upscaling of the professional development?;
    - IBST?;
    - Linking schooling (e.g. subjects) and the world of work?

http://www.mascil-project.eu/
http://mascil-norge.org/index.html
http://www.instem.tibs.at

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