Gruppo di Formazione Matematica della Toscana

XXII Convegno sulla Didattica della Matematica

Viareggio, 8 - 9 settembre 2005

Un problema europeo: che fare per favorire la scelta degli studi matematico – scientifici?

Franco Favilli *

Dipartimento di Matematica - Università di Pisa

* favilli@dm.unipi.it

Introduzione

Lisbon strategy:

- ***A new strategic goal for the European Union: to become, by 2010,***

"the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion."

- *The Lisbon conclusions contained a number of benchmarks and guidelines in the area of education and training, as well as in other policy areas.*

Introduzione

- *The Education Council and the Commission endorsed a 10-year work programme to be implemented through the open method of coordination. Approved by the European Council, these agreements constitute the new and coherent Community strategic framework of co-operation in the fields of education and training.*

Introduzione

Working groups *(at present)*

- *Education and Training of Teachers and Trainers*
- *Key Competences*
- *Language Learning*
- *Information and Communication Technologies*
- *Maths, Science and Technology*
- *Making the best use of resources*
- *Mobility and European cooperation*
- *Open Learning Environment; Making Learning Attractive, Strengthening Links with Working Life and Society*
- *Active citizenship and social cohesion*
- *Reforming guidance and counselling*
- *Recognising non-formal and informal learning*
- *Measuring progress through indicators and benchmarks*

Introduzione

Objective 1.4: Increasing recruitment to scientific and technical studies

Key issues

- Increasing the interest in mathematics, science and technology from an early age
- Motivating more young people to choose studies and careers in the fields of mathematics, science and technology in particular research careers and scientific disciplines where there are shortages of qualified personnel, in a short and medium term perspective, in particular through the design of strategies for educational and vocational guidance and counselling
- Improving gender balance among people learning mathematics, science and technology
- Securing a sufficient numbers of qualified teachers in mathematics and scientific and technical subjects

Introduzione

Students enrolled in mathematics, science and technology as a proportion of all students in tertiary education (ISCED 5A, 5B and 6) (2001)

EUROPEAN COMMISSION

Directorate-General for Education and Culture

IMPLEMENTATION OF "EDUCATION & TRAINING 2010" WORK PROGRAMME

WORKING GROUP D

"INCREASING PARTICIPATION IN MATH, SCIENCES AND TECHNOLOGY"

PROGRESS REPORT – DECEMBER 2004

The five key recommendations arrived at by the W.G.

- *. the teaching of mathematics, science and technology should be an entitlement for all children from the early stages of education and should be mandatory at all levels;*
- *. more effective and attractive teaching methods should be introduced in mathematics, scientific and technical disciplines at both primary and secondary level, in particular by linking learning to real-life experiences, working life and society and by combining classroom-based teaching with extra-curricular activities;*
- *. the professional profile and practice of MST teachers should be enhanced not only by providing them with opportunities and incentives for updating their knowledge of both content and didactics of MST through the provision of effective initial and in-service training and by improving teaching resources, but also through the provision of incentives and special measures to ensure their long-term commitment to the teaching profession;*

The five key recommendations arrived at by the W.G.

- *measures involving teaching methods, pedagogical tools and assessment measures for special needs groups such as high and low achievers and pupils from ethnic minority backgrounds should be addressed along with measures to address gender-specific attitudes to mathematics, science and technology;*
- *strong and effective partnerships between schools, universities, research institutions, enterprises, parents and other players should be strongly supported and encouraged at all levels, both to improve the quality and attractiveness of teaching and to effectively prepare young people for working life and active citizenship.*

Recommendation 1 - Entitlement

- The formal introduction of MST subjects at pre-school stage does not appear to be priority. Very much emphasis on learning through play and linking topics to the everyday environment and experience of the child.
- Mathematics appears to be particularly well established at all stages of the curriculum, although there are issues in relation to pedagogy in increasing its attractiveness.
- In a few countries, a more holistic approach by integrating MST subject with other areas of the curriculum by developing cross curricular links.

Recommendation 1 - Entitlement

- The relation of MST to real-life experiences and the development of appropriate pedagogy continues to be an issue.
- Technology is less well established at particular stages of the curriculum, although some countries are beginning to address this.
- The issue of whether technology should form part of the curriculum for all, or whether it should be focused on vocational education continues to be subject for debate.

Recommendation 2 – Pedagogy

- Clear recognition that more effective and attractive teaching methods are necessary in the development and promotion of MST.
- A large number and variety of partnerships are in place
- The main barrier to developing more effective and attractive pedagogy is the perceived reluctance of teachers to adopt new methodologies in place of well established traditional ones.
- Why is this the case? It seems likely that until the cause is established, measures taken in the various partnerships to introduce new pedagogies may prove less than successful.

Recommendation 3 - Teachers

- A number of countries have carried out reforms to improve initial and in-service training in MST as part of wider reforms involving teacher education generally.
- Several countries highlighted weakness in this respect and had no significant measures to enhance the professional profile of MST teachers.
- The majority of countries have no initiative in place to address the problem of long term engagement of MST teachers.
- The role of the universities in conducting research in didactics and supporting teaching in schools is recognised as an important one. In some cases the work of the universities is supplemented by in-service training for teachers.
- Support on resources and didactics can also be provided by means of web-based networks or resource centres.

Recommendation 4 – Special groups

- Although the needs of high ability pupils are fairly well catered for through a range of initiatives, the needs of lower ability and ethnic minority pupils are less well addressed in relation to MST subjects.
- There is perhaps a danger, that by concentrating so exclusively on the needs of talented pupils, messages about the perceived difficulty of the subject area may be transmitted to other pupils, thus reducing their interest in study in the area.
- Gender is an issue which is being weakly addressed in the area of MST, with very few comprehensive or large scale initiatives in place.

Recommendation 5 - Partnerships

- A wide range of partnership exists between schools and universities in particular.
- A variety of forms, ranging from single day events (as in the case of Science Fairs and MST competitions) to more long term and structured partnerships involving courses offered in universities or the setting up of resource centres to tackle curriculum and resource issues at school level.
- Whereas university staff, school staff and pupils are involved in all initiatives, there is clearly greater scope for practice which involves both the public in general and parents in particular. This was an area which few countries specifically addressed through partnership.

Recommendation 5 - Partnerships

- There is clearly opportunity for a media role in events with a public profile.
- Whilst there are clear partnerships formed between universities and schools in attempt to make MST subjects more attractive to pupils, very few partnerships in this area address the issue pedagogy by helping teachers to adopt more user friendly methods.
- Whilst some countries clarified whether initiatives were at individual, local, regional or national level, others did not. It would seem important for the exchange of good practice that this should be clearly stipulated.

Subgroup on 'Partnerships' (report)

Obstacles:

- lack of human resources available for such collaboration within tertiary-level institutions;
- lack of sufficient qualified staff in the field of MST education in some countries;
- lack of resources in general for higher education institutions to be able to face a potentially large demand that might arise from schools.

Subgroup on 'Partnerships' (report)

Conclusions / recommendations:

- The Subgroup recommended that efforts should be made 'to promote the creation of new positions for MST education in higher education institutions'.
- Governments should encourage schools to liaise with universities, parents associations, and industry on MST subject development.
- "Second-chance opportunities" were considered as good potential methods for inspiration in establishing partnerships and should therefore be supported.
- Member States should promote and/or update 'school development plans' for MST.
- Partnerships should be seen as 'equal opportunities and reciprocal partnerships' – universities should be able to learn from school partners and school partners from universities.
- Alliances should be formed between stakeholders so as to ensure equitable access pathways to training programmes and employment in the field of MST.