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Working Group D 'Mathematics, Science and Technology'

Objective 1.4 "Increasing recruitment to scientific and technical studies"

Draft conclusions and recommendations

- July 2004 -

In its 2004 recommendations, the Working Group MST restates the need for education policies in the area of MST to assign priority to education pedagogies involving meaningful practical applications and ensuring the active participation of learners.

I. Curricula

The Technology Field

- Technology represents a minority of initiatives and is less well established than Science and Mathematics 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.

Curricula should clearly take into account the important role of Technology education which should be addressed as a field in its own right within MST.

II. Pedagogic and Teachers

The low achieving pupils

- Although the needs of highly able pupils are fairly well catered for through a range of initiatives, the needs of low achieving pupils are less well addressed in relation to MST subjects. Whilst there may be a perceived need to attract the most able pupils to the subject areas, by concentrating so predominantly on these, the perception of MST subjects being appropriate only for more able pupils may inadvertently be perpetuated. There is a danger that, by concentrating so predominantly on talented pupils, messages about the difficulty of the subject areas may be transmitted to pupils who might otherwise be interested, but who

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lack confidence in their own ability to succeed. Policy measures which address issues of accessibility and inclusion would increase the attractiveness of the subjects for all pupils, and avoid possible perceptions of elitism which may, at present, prevail.

The needs of low achieving pupils in MST should be addressed specifically through providing more opportunities for practical activities and a

Gender imbalance

➢ Gender is an issue which seems to be weakly addressed in the area of MST, with very few comprehensive or large scale initiatives in place. There is clearly room for development in this area. Even where gender imbalance was considered a problem, very few initiatives exist to address this problem and those which do, tend, with few exceptions, to be fairly small scale and operate at local or regional level. And in those countries where it is not perceived to be a problem, there is very often imbalance regarding technology. Gender imbalance in MST remains an issue for most European countries, either in general or in specific areas of MST.

It is essential that policies tackle the problem of gender imbalance in MST either through general policies designed to address equal opportunities and/or through

The role of Teachers

➢ The ability of teachers to help pupils make informed decisions about careers varies widely and is in most cases underdeveloped. There is a need to strength the provision for teacher training in this area, or the development of partnerships with industry to address this.

➢ There is a clear recognition that, even if this is not necessarily easily achieved, more effective and attractive teaching methods are necessary in the development and promotion of MST. Some of the areas recognised in this respect are:

- The relation of MST to real-life experiences and the development of appropriate pedagogy; a focus on applied science and technology with practical understanding of applications to industry and re-service; extra curricular activities such as visits, competitions, fairs etc.
- Pre-service and in-service training for teachers especially at primary education level, who often lack the confidence to deal with science and technology effectively, is highly important, because of a lack of knowledge of both subject content knowledge and appropriate didactics.
- The access to well-equipped resource centres is desirable to help develop both pedagogy and resources.
- The development of guidelines to support pedagogy; the appointment of coordinators within schools to provide advice and monitor changes.
- The need to consider a more integrated approach centred on themes.

➢ The main barrier to developing more effective and attractive pedagogy is the perceived reluctance of teachers, especially at secondary level, to adopt new didactics. Whilst there may be many reasons for this, including the nature of pre-service training, the age and past experience of teachers, the nature of support provided within schools, or the implicit theories held by teachers about learning

and teaching in general, it is an important area for policy makers to address. Until the reasons for teacher reluctance to change are clearly established, the effectiveness of any form of intervention will be in doubt. Once this has been established, policy measures relating to the areas highlighted above may be implemented more effectively.

- An important area which seems closely related to pedagogy is assessment. One factor related to teacher reluctance to adopt new methodologies may be the pressure placed upon them by current assessment procedures. Where assessment is focused on the reproduction of subject knowledge, a transmission model of teaching is more likely to prevail. . Two countries have addressed this issue through the introduction of practical work as well as theoretical work into their assessment procedures. This is an issue, which policy makers in other countries may wish to consider.

Pedagogy is a crucial area for decision makers to address if MST subjects are to in effectiven attractiveness. should there taken to conn systematically MST teaching to real-life

Pupils' assessment procedures should give equal importance to theoretical and practical work and promote new teaching methodology.

III. Beyond curricula

Partnerships

- A wide range of partnerships in the field of MST exists between schools and universities in particular; however there is clearly greater scope for practice which involves both the public in general and parents in particular. The role of parents in increasing interest in MST has not been addressed. This is an area for consideration and development.

Policies should address the perceived reluctance of teachers to adopt new didactics in the field of MST and find ways and means, in particular through the dissemination of good practices, to change the situation. Teachers should also have access to resources centres supporting the development of new innovative pedagogical methods.

Initiatives specifically aimed at developing interest in technology in particular are however scarce. This is another issue which merit consideration.

Partnerships aiming at providing "second chance" opportunities for those who did not opt for MST subjects, and girls in particular, are seen to be particularly effective.

Although there are partnerships in place which attempt to make MST subjects more attractive to pupils, very few partnerships are currently addressing pedagogical issues and are aiming at helping teachers to adopt more active and authentic teaching methods. This is an area where there is clearly room for development.

Three types of obstacles were identified and need to be addressed: the lack of human resources available for such collaboration within tertiary level institutions;

the lack of sufficient qualified staff in the field of MST education' in some countries; and the lack of resources in general for higher education institutions to be able to face a potentially large demand that might arise from schools.

Any measure taken (at policy level or through the development of specific initiatives/partnerships) to increase interest and participation of pupils in MST, and in particular girls, should foster the participation of parents in order to help them overcome their prejudice vis-à-vis these fields.

Partnerships/initiatives aiming at providing "second chance" opportunities for those who did not opt for MST subjects should be developed.

Partnerships between schools and universities to increase interest and participation in MST should be made more frequent. Universities in particular should have the adequate means (at human resources and financial levels) to face the potentially large demand that might arise from schools.