

Evidence-Based Policies on Mathematics Education in Europe

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Abstract Evidence-based policies have important place for the educational development. Monitoring and reporting activities through national and international reports and surveys provide data sources for a comparable education in Europe and make contribution to a more effective policy making process. It is seen that only almost half of the European countries carry out such surveys and reports by the year of 2010/2011 within the context of teaching methods and low achievement in mathematics education. In order to reach to the common educational objectives, systematic data sources are required both in national and international level.

Keywords Evidence-based policy, low achievement, teaching methods, Europe, mathematics education

1. Evidence-Based Policies in Education

There is an increasing pressure across the OECD countries for a greater accountability and effectiveness in educational policies and systems. Available information often does not provide the elements necessary for decision-making, either because the rigorous research relevant to policy needs has not been conducted, or the research that is available does not suggest a single course of action (OECD, 2007). Internationally comparable data on education, training and skills have acquired particular importance with the growing together of European

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countries and the implementation of common EU policies and strategies (Descy, Nestler, & Tessaring, 2005). There are only a few countries in Europe have national structures to gather and analyze data systematically on the development of mathematics education (EC, 2011).

A considerable set of key data needed by policy makers and researchers is missing and especially for the objectives in reducing the number of low-achieving students in mathematics, in increasing the number of graduates in math-related fields and also varying approaches and methods used in teaching mathematics should be supported by further monitoring and reporting at both national and European levels (EU, 2011; Descy, Nestler, & Tessaring, 2005). Therefore, national tests results could be used more systematically for policy formulation at all levels of decision making.

One of the three conditions must exist for evidence-based reform to prevail has been stated by Slavin (2008) is that there must be a broad range of proven programs in every area of education, every subject and grade level. Evidence-based policies will not prevail if demanding strong evidence requires educators to use just one or two proven programs, or if no programs have strong evidence.

Reporting activities in European countries are generally carried by national organizations, which are pedagogical centers or research institutes. Their structures are set up by Ministry of Education (MoE) or collaboration with MoE. Their tasks are producing statistics, monitoring developments in education system and analyzing & interpreting trends (EU, 2011). Some of important comparable statistics in which EU countries and Turkey included are Eurostat, UNESCO, OECD (organizes PISA), IEA (organizes TIMSS) (Descy, Nestler, & Tessaring, 2005). National reports and surveys provide data for these comparable statistics in international level.

2. Evidence-Based Policies on Teaching Approaches, Methods and Classroom Organization

Many European countries do not have any national organizations in place to regularly carry out such reporting activities. In others, these activities are undertaken by pedagogical centers or research institutes. In their work, they often consider results from both national assessments and international surveys on student learning outcomes. Amongst other topics, these bodies also report on teachers' choice of teaching methods and activities for use in mathematic lessons.

Figure 1. National surveys on teachers' choice of teaching methods and activities, 2010/11



As it is seen in Figure 1, approximately half of all European countries described monitoring the use and success of different teaching methods on an on-going basis.

A number of countries (Belgium (Flemish Community), Austria, Spain, Latvia, Malta, Norway, and the United Kingdom (Scotland)) report using surveys to investigate teachers' choice of methods and activities, with Malta and Norway both making specific mention of using the TIMSS surveys to gather such information.

For example;

- Austria the Federal Institution for Educational Research, Innovation and Development of the School System
- Sweden, National centre for math education (Göteborg University)
- UK (Scotland) Statistical unit collects data from national tests in mathematics; Scottish Qualifications Authority collects data on national qualifications (dept-analysis), Learning & Teaching.

In **Spain**, the publication of education indicators periodically provides data about the most frequently used teaching methods, as indicated by teachers in the questionnaires for the national assessments of primary and secondary education.

Countries (Belgium (French Community), the **Czech Republic**, Bulgaria, France, Malta, **Romania**, Slovakia and the United Kingdom (England, Wales and Northern Ireland)) also use school inspections to investigate which teaching methods are being used. Often teaching methods are analyzed and discussed and teachers are given advice during inspection visits. Information from inspection visits is subsequently shared via regional or national reports.

3. Evidence-Based Policies on Low-Achievements

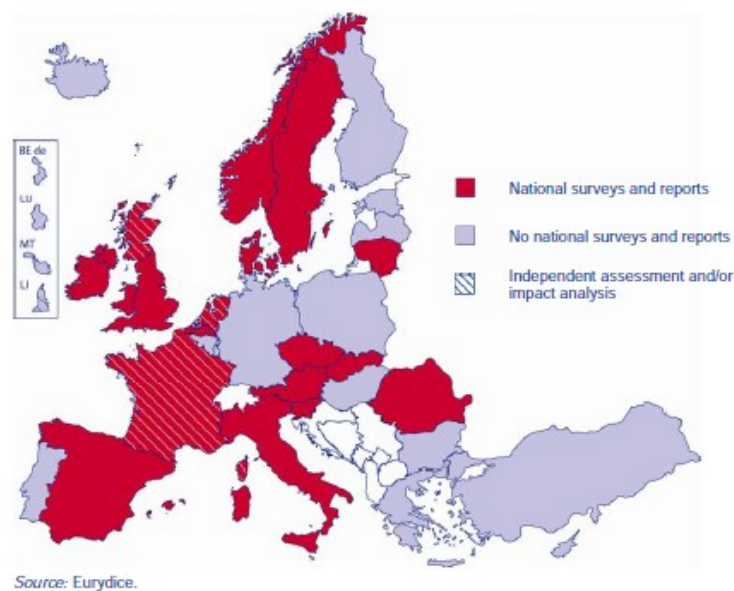
ET 2020 is an important international policy document that gives direction to European countries' educational policy objectives and related strategies. The goal by ET 2020 has been stated as (2009): *"The share of 15-years olds with insufficient abilities in reading, mathematics, and science should be less than 15%."*

Countries often use analyses of PISA (Program for International Student Assessment) by OECD and TIMSS (Trends in International Mathematics and Science Study) by IEA (International Organization for Educational Assessment) to identify students' low achievement.

Data source by PISA cover young people aged 15 enrolled in an educational institution for every 3 years in OECD member and partner countries willing to participate (68 countries in 2006). PISA provides a better understanding the factors influencing the performance of education and training systems;

Data source by TIMSS cover all students at several grade levels (4 years and 8 years of schooling + final year of secondary education) since 1995 per each 4-5 years in 46 countries in 2003 (12 EU Member states + Bulgaria, Norway and Romania). TIMSS will pursue this cycle of internationally comparative assessments and provide data about trends in mathematics and science achievement over time.

Figure 2. National surveys and reports on low achievement in mathematics, 2010/11



As Figure 2 shows, similarly, half of all countries in Europe do not conduct any such surveys or reports. Even less common are independent evaluations of support programs for low achievers.

In **Spain**, a report on the results of the first General Diagnostic Evaluation carried out in 2009 with students in the fourth year of primary education shows that there is a strong correlation between achievement level in mathematics and four out-of-school factors: parents' level of education and occupation; the number of books at home; and the availability of other resources at home such as a quiet place to study and an internet connection.

National reports in **Romania** have identified several factors that negatively affect performance in rural schools. These are mainly related to the high turnover, low motivation (social and financial) and the inadequate mathematics qualifications of teachers in these schools, as well as the grouping of pupils in mixed age classes at primary level.

In **Italy**, the report of Servizio Nazionale di Valutazione (National Assessment Program) underlines the regional differences in the north and south parts of the country (especially increase in lower secondary education). While performance is fairly uniform in the north, it varies greatly in south.

4. Conclusion

Approximately only half of European countries report investigating about teaching methods and approaches and low achievement in mathematics. Research evidence and impact studies are useful to analyze existing educational policies and also make new policies. Therefore, monitoring and reporting efforts are required to be strengthened at both national and European levels to achieve the common European objectives by international policy documents.

Governments should provide encouragements to use programs that have been proven to be effective. If government policies began to favor programs with strong evidence, developers, including publishers, software developers, university researchers, and

entrepreneurs of all kinds, would have an incentive to engage in serious development and evaluation efforts (Slavin, 2008).

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