

SMSO

Survey of Mathematics & Science Opportunities

CURRICULUM ANALYSIS TECHNICAL REPORT SERIES No. 6

ANALYSIS OF PRE-SELECTED COUNTRY GROUPS.

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Analysis of Pre-Selected Country Groups

- The 48 nations participating in the TIMSS curriculum analysis represent a variety of geographic regions, cultural and economic groups
- Sociological, historical and political science curriculum inquiry suggest ways in which such groups of countries may be similar or different in their intended curricula.
- Historicist and other sociological theories of curricula predict that some groups of countries will share distinctive curricula as a result of shared historical, political and cultural circumstances.
- The curriculum analysis techniques will explore some of the differences and similarities between clusters of countries.

With 48 countries participating, the TIMSS Curriculum Analysis is by far the largest cross-national in-depth study of the content of the intended curriculum. This large sample contains nations representing an immense variety of geographic, cultural and economic circumstances.

Students of curriculum have long pointed out a variety of reasons that may cause the intended curricula of various groups of countries to be similar or different. Thus, groups of countries have been postulated using various criteria. Some of the most oft-cited criteria are:

1. *Economic Criteria:* It has been suggested that countries with similar economies or that compete in the global economy with comparable advantages or disadvantages face similar curricular challenges.

Policy makers in many countries have come to believe that personal development in school is linked to national economic development - and that success in school is equivalent to mastery of the curriculum. Groups of countries facing similar economic challenges may thus pursue (or wish to pursue) similar curricular policies. This explains a large portion of interest in the curricula of countries perceived to be highly competitive in the world economy. It also lies at the heart of much of the debate on “World Class Standards.”

On the other hand, economic criteria have also been cited to suggest other reasons why countries might share similarities in the characteristics of their educational systems.

In the mid-1970s, a group of theorists (see for example: Carnoy 1974, Amin 1975, Sica and Prechel 1981), used dependency theory to develop accounts of the imposition of dominant models of schooling on nations of the economic and social periphery. These authors theorized that the propagation of curricula from the great metropolises to the periphery was a particular instance of cultural domination within the framework of an international division of labor.

Thus, it is hypothesized that countries that are in dependent economic relations will share similar curricula with the dominant nation, in a fashion similar to that of the relationship between educational systems of colonized nations and the systems of colonial powers.

Consequently, most observe that these transfers take place between an "industrialized" or "metropolitan" center and a "dependent" or "peripheral" nation. Thus, it is often stated that the transfer of curricula either results in the recipient country adopting a curriculum with very little relevance for local needs (Lillis 1982, Jansen 1989, Gerdes 1988) or that is in conflict with the local society's preexisting conceptions of what constitutes worthwhile knowledge (Hewson 1988, Falgout and Levin 1992). Both consequences are thought to adversely affect educational achievement.

Some countries are challenged by similar economic, social and political circumstances and this has important implications for their educational systems and, consequently, their curricula. Some pedagogical strategies are more expensive than others. This implies such strategies are more or less frequently used in different countries according to their economic circumstances. Practical activities in the sciences are particularly costly and many less developed countries are compelled to limit their use. International assistance agencies are particularly concerned with discovering how best to guide educational investment strategies in this area. It is felt that countries require empirical data so that they can judiciously restrict the use of expensive practical activities to areas in the sciences in which they are apt to provide the most substantial returns in terms of academic achievement (Haddad and Za'rour 1986).

2. *Internationalization of curriculum expertise:* Some countries have become influential in education at the international level. Research institutions, international donor agencies, and the internationalization of textbook markets are some instruments through which such influence is

transmitted. Many have described the transfer of curriculum expertise among countries. Often such descriptions provide historiographies that are intended to describe, for example, how New Zealand followed the encyclopedist tradition of Scotland in the development of its curricula - or how Latin America followed a different encyclopedist tradition, that of France, in its first educational institutions (Holmes and McLean 1989).

There is also the phenomenon of the international marketing of textbooks. It has been observed that there are large multinational firms that have come to dominate, for example, the textbook markets of English, French and Spanish speaking nations. Since the textbooks developed by these multinational firms are created to simplify international marketing, the contents of these materials - originally designed for the educational requirements of countries with the largest markets - are typically sold with a minimum of adaptations to local circumstances. It has also been recently observed that these publishing houses are becoming involved in the translation and marketing of their materials in other languages. This increased dominance of the international textbook market by the great publishing houses of the United States and Europe is thought to have an homogenizing effect on the content of schooling throughout the world (Altbach 1983, Holmes and McLean 1989).

3. *Other shared cultural circumstances:* Countries that share similar colonial heritages, languages or other cultural/geographic characteristics are also thought to have similar intentions in their educational systems. For example, some developing countries and ex-colonies of the United Kingdom have traditionally included agriculture or "rural science" in their curricula (Bergman 1985, Hornberger 1987). Local circumstances presumably also influence the sequencing of topic coverage in mathematics as well. It has been argued that the mathematics curricula in those countries in which most students finish their academic careers in the primary grades, for example, should be very

different from those in which they do not. It is suggested that such a situation has implications for the appropriate sequencing of topics, since mathematics curricula should provide skills and information that have immediate practical applications in daily life, and should not be preoccupied with teaching of skills that are considered essentially prerequisites for eventual application in later grades (Kelly and Lassa 1983, Villavicencio 1984, D'Ambrosio 1991).

Kamens and Benavot (1991) examined the amount of instructional time stipulated in a large world-wide sample of national curricula for science and mathematics instruction. Even in the examination of such generic and comprehensive categories, some important differences in emphases were discovered. For example, their study revealed two regions: Latin America and Eastern Europe, where the official curriculum prescribes considerably more time to the teaching of mathematics and science than the rest of the world. Simultaneously, they also discovered that such differences have been diminishing over time throughout their sample.

Potential Contributions of the TIMSS First International Report

Given the large sample of countries participating in the Curriculum Analysis, the first international report is in position to contribute to our knowledge concerning similarities and differences in the curricula of groups of countries.

The following country groups are anticipated:

1. Geographical region: Countries will be grouped according to geographical criteria, resulting in groups sharing some cultural characteristics and often also representing major markets.
2. Economy and trade: Level of industrialization will be used in both the traditional major groupings (Industrialized, newly industrialized, etc.) and also according to recognized criteria such as per capita energy consumption. Additional criteria of trade and economics will explore the possibility of distinctive curricula among OECD countries, those of the Pacific Rim, the European economic community, etc.
3. Language: Countries sharing a common language will also be analyzed in groups: German, French, English and Spanish speaking countries are well represented groups in the current data set.
4. Demographics: Additionally, demographic criteria such as percentage of population living in rural areas and literacy rates will also be attempted.

Examples

Exploration of similarities and differences between groups of countries has begun.

Figure 1 presents data showing important differences among countries grouped according to level of industrialization criteria in terms of topic coverage in textbooks for Population 2.

Figure 2 explores similar issues in mathematics topic coverage in Population 2 textbooks among countries grouped according to geographic/historical criteria.

Summary

Previous research has pointed to the possibility of clusters of countries having distinctive curricula due to shared political, economic, historic, or cultural circumstances. We explore the criteria most often cited for designating groups of countries that may share common educational traditions and have proposed some such groupings that will be used in analysis to be reported in the first research reports of the TIMSS Curriculum Analysis. Preliminary results are presented here, intended to demonstrate the utility of such analyses.

Selected Population 2 Science Topics
by
Country Group

Science Topics	Developing Countries	Newly Industrialized Countries	Eastern Europe	Developed Countries
	Ave	Ave	Ave	Ave
Life Sciences				
Biomes, Ecosystems	6.0	3.7	0.0	0.9
Habitats and Niches	4.1	1.5	0.0	0.9
Interdependence of Living Things	7.0	2.0	0.0	1.6
Physical Sciences				
Energy Types, Sources	4.4	2.0	5.9	5.1
Electricity	2.6	11.1	12.3	11.2

FIGURE 1

Selected Population 2 Mathematics Topics
by
Geographical Region

Mathematics Topics								
	Ave	Ave	Ave	Ave	Ave	Ave	Ave	Ave
Numbers								
Operations	3.7	4.6	1.9	7.7	4.3	2.6	1.5	13.4
Integers and their Properties	5.9	4.4	1.3	4.9	1.4	6.4	7.1	5.3
Rational Numbers & their Properties	11.7	1.0	0.7	4.5	2.0	1.8	3.3	4.8
Algebra								
Patterns, Relations & Functions	11.0	1.2	3.5	4.3	9.2	5.0	19.9	6.2
Equations and Formulas	15.3	16.6	22.7	15.7	18.6	15.2	15.6	0.5

FIGURE 2

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