

Chapter 19

Conclusion ‘Laws’ of Curriculum Implementation and the Future in Which We Are Living



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Several decades ago, the main tendencies in the school curricula of mathematics revolved most of the time around disconnected collections of mathematical topics, with little association to pedagogical approaches, or explicit socio-cultural and pragmatic purposes. In recent times, international trends have established curricula around competences, a pragmatic role of mathematics is fostered to serve societies and their citizens, interdisciplinary perspectives have been promoted and in particular around STEM, larger spaces are incorporated for statistics and probability, and with force: The role of technologies impacts everything. Undoubtedly, the strategies and educational agents to implement curricula within these tendencies are different from those that could be used in the past. And things are moving even faster and toward new perspectives due to the pandemic and a new world scenario.

Is not this expressed in the growing role we give to real contexts in curricular design, textbooks, teacher preparation, or national and supranational assessment? Does not the simple existence of MOOCs, Mini-MOOCs, Tablets, Smartphones, the Internet, remind us that the demands in curricular implementation are no longer the same?

Given the current stage of development of mathematics education as a discipline, it is at least desirable that before proceeding to their implementation the reforms be based on national and international research. Doing so allows us to provide intellectual supports and examples of good practices for the progress of curricular changes. However, the same implementation process can provide elements that lead to an improvement in the relevance and quality of a curriculum. At the end of the day, it must be understood that a curriculum is a historical object that must undergo modifications. A participation of the educational community, within an official process oriented and relatively controlled, can favour this. However, in social or

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national contexts that do not have those levels of ‘control’, resources or a maturity in their education system, the result may be drastically different. This is another example of the diversity of options that we have tried to show in this work.

The issue also has implications for the study or assessment of reforms, and therefore for the research: How has a reform been designed in relation to the results of the international research and experiences? What is special and specific in the implementation of a particular reform?

In curricular reforms, external and internal factors intervene that greatly condition the nature, rhythm and the possibilities of their success or failure. Three variables that generate or sustain the changes are also crucial, and to which we have given a place in this work: their visions, values or goals. And, in the latter, there is a condition that benefits the possibilities of its success: its coherence, which invokes historical and social relevance; but this not only has theoretical dimensions, its materialisation is favoured if the main reforming agents (either within the ministries of education, universities, or teams of individuals) obtain the essential continuity in social processes. Sometimes that continuity occurs as a result of political decisions, sometimes not, chance almost always intervenes and always plays an important role in reforms.

The ‘Law’ of Diversity

The experiences we have analysed and brought to our discussion show important differences both in the nature of the reforms and in the contexts in which they occur.

One example: our review suggests that sometimes reforms can directly touch only some of the components of the curriculum vectors (see Niss in Chap. 16), although inevitably, in one way or another, they affect the other components. This selection of components already makes a difference, but also the way in which these relate to the other ones.

Another dimension: in the development of reform there are different agents and levels of intervention (authorities, scientific or professional organisations, teachers, advisors, inspectors, principals) and the combination of these interventions is crucial. How this occurs can determine the course of the reform. In Tunisia, for example, the role of inspectors played an important role. Other of these agents are politicians and educational authorities of the highest level. Costa Rica and China, although with very different political and socio-economic conditions, are examples that achieved continuity in the support of the reforms by these agents. Denmark provides an example to a certain extent in the opposite direction. The academic associations in the mathematics community and of mathematics education in the French reform -another agent- were very important. They brought legitimacy, coherence and support.

The role of the diversity of contexts can be seen in the ‘time’ or ‘timing’ of reforms. In countries with social, political and cultural stability it is possible to have many years to carry out an appropriate reform (or not), and even to continue

advancing it. (Quebec, China and France are examples we described extensively with at least ten years dedicated to implement the reforms.) In other contexts, timing can be provided by political or social circumstances, and times and rhythms may be determined by them. This impacts the chances of success.

The unavoidable diversity, we have insisted on here, allows us to state what we can call a first general 'law':

There can be a combination of factors for the implementation of a curriculum reform that is successful in one country and will not be successful in another.

There is one consequence of this 'law':

It is not adequate to try to mechanically translate, import curricula or curricular ideas from one country to another; from one context to another.

However, this does not mean that it would be inappropriate to affirm that good practices, ideas or strategies, endowed with a serious, critical and responsible assessment, can be a source of inspiration for curricular design and implementation, they can serve as a model in other scenarios.

The 'Law' of Two Directions

Another trend that weighs in the historical scenario has to do with the democratisation of individual and collective efforts, and, in particular, the relationships between institutions or governing bodies and the population. Educational and technological progress enhances that situation. We have described here curricular changes formulated by governments, as well as others raised by universities, by groups of individuals, or by in-service teachers. Different groups provided different scopes for reforms. But everything points to the fact that the success of reforms depends on a harmonious combination between actions that go from the top to the bottom and those that come from the bottom up.

Artigue insisted that, without the individual commitment, internalised, towards a reform, of the teacher, of the director of an educational institution, or of the pedagogical advisor, the reform will not be able to progress. The individual needs to feel part of the reform. And Niss has alerted us that a reform will have less chance of success, projection and continuity if it does not have the national, governmental or institutional support in resources and actions.

This brings us to a second 'law':

To achieve success, the existence of appropriate resources, especially for teachers, and implementation strategies must be considered, allowing for both top-down as well as bottom-up developments. What is essential is to create a good synergy between these two processes.

The harmonious specific point, which integrates efforts and generates progress, depends, of course, on each reality. As we pointed out in the conclusion of Chap. 16, the differences between developed and developing countries or regions are significant.

It should be important to underline that this harmonious point is never easy to determine.

The ‘Law’ of Alignment

We were able to show multiple roles in the participation of teachers within curricular reforms, from the creation of specific materials, to advising on the design of the curriculum or in the development of professional development programs, and all in varying stages. To facilitate the implementation of curricular reforms nobody doubts that a good preparation in mathematics is required, but it must be emphasised, also that a close contact with the school and pedagogical materials with which educational agents must work (adapted to the historical moments). The way in which this is done varies significantly, but when focusing on the curricular implementation there is a greater and significant value to these last components; something that does not happen in the same way when the focus is only on the design.

It is a consensus that there must be important connections and alignments between the initial preparation and professional development of teachers to sustain curricular reforms, with greater force in the case of profound transformations. But not only the congruence between the reform, its implementation and the conditions of the teachers is raised, it is also invoked for the necessary resources and for the national assessment.

Here emerges a third ‘law’:

For the most adequate implementation of a curriculum reform there must be alignment of all the educational means with the reforming efforts.

The ‘Laws’ of the Long-Term and Uncertainty

A fourth ‘law’ of reform appears to be:

Except in the case of curricular changes with very little scope, reforms must be conceived as long-term processes.

Understanding this is very important, as political actors, educational administrators and societies in general tend to push for results and implementations in the short term. Inappropriate reduction of the time and resources needed for a reform inevitably conspires against its success.

No matter how well designed a reform is or how planned its implementation is, it is inevitable that there are unforeseen events that force adjustments (sometimes substantially) of the implementation actions. The ‘ecological’ approach introduced by Artigue in Chap. 16 reinforces this perspective.

This leads us to a fifth ‘law’:

Curricular reforms are not in vitro processes, and therefore inevitably contain a large burden of unpredictability and uncertainty.

A final 'Law' (Within the Scenario of the Pandemic)

The unpredictable has hit us hard in the face with the COVID-19 pandemic. Its implications for the planet are not yet clear. As far as education is concerned, there are some elements that seem to be incorporated in the following years: for instance, the role of 'non-face-to-face' education will play an extraordinary role in all settings. And that implies an intervention of different technologies in ways not seen before. This will impact educational processes at various levels in various ways. The face-to-face and non-face-to-face will be articulated with new perspectives.

Not all educational levels or all school disciplines will be impacted in the same way. Those who demand more face-to-face or individual accompaniment will have to make further adjustments. The learning of mathematics (by the nature of the discipline) has always required greater pedagogical support. Responding to this situation will be a major challenge for the mathematics and mathematics education communities.

Evidently, beyond this sort of issue other educational variables intervene. Aims, values, content, teaching and learning strategies, should be in tune with a changed world where global environmental and general humanity issues demand a stronger place. The new pedagogical mediation will exert pressure on all the actions of the different educational agents (in teaching, advising, supervising, planning, managing). The impact affects the building of learning, assessment, resources. To a certain extent initial teacher preparation and professional development should be renewed.

The impact of the pandemic, however, is not experienced and will not be lived in the same way in all nations and regions. Those with higher levels of poverty and fewer socioeconomic, cultural, educational, and ICT resources will have much greater difficulties to stabilise and progress in the near future. Extraordinary percentages of student dropouts and very serious losses in schooling are foreseen. A recovery will take several years.

The implementation (and design) of curriculum reforms in mathematics cannot evade this complicated scenario. Definitely. This leads us to an awful 'law':

In the scenario opened up by the COVID-19 pandemic, all curricular implementation must include a Factor (RRR) that involves at least three actions in connection to objectives: Rethinking, Reformulating and Reprogramming. This Factor RRR is most likely to be higher in countries or regions within a country with lower socioeconomic, educational and cultural development.

In the new scenario, it seems just reasonable that international understanding and co-operation for education (particularly for mathematics curriculum reforms) should be strengthened.

The Place of Implementation

This may be considered a strong opinion: There has been too much emphasis in the world on curricular design and much less on implementation. Perhaps this is why it is useful to underline the demand for a ‘Perspective of praxis’ (Ruiz, 2013), which helps us to separate ourselves from the visions that see the curriculum as an almost “in vitro” experience that should be implemented later on at some other time. This issue acquires greater dramatic effect when it is found that no matter how well designed a reform is, how good the previous pilot plans are, there will always be large doses of unpredictability.

Implications? To help move future curricular changes more successfully, it will be necessary to intensify research and intellectual constructions on the implementation of the reforms of school mathematics. This would provide elements not only for the implementing action, but for the curricular design itself.

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Reference

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