Tomorrow Never Dies:

A Socio-Historical Analysis of the Luxembourgish Curriculum

Thomas Lenz, Anne Rohstock, and Catherina Schreiber[1]

Introduction

In 2006, over 80 percent of the Luxembourgish population believed that young people's interest in science is essential for the future prosperity of the Grand Duchy, yet only nine percent were actually satisfied with the quality of science teaching (Ministère de l'Education nationale et de la Formation professionnelle 2007a, p. 82). This result reflects a European (if not a worldwide) trend: In 2005, over 80 percent of the European adult population agreed that science classes are a major promoter of economic growth in the European Union, but only 15 percent felt comfortable with the quality of science classes in schools (European Commission 2006).

These surveys demonstrate that there is an extremely high public concern for curriculum issues today, a fact ultimately highlighted by the Programme for International Student Assessment (PISA), which was launched for the first time in 1997 by the Organisation for Economic Co-operation and Development (OECD). Both PISA and the OECD stress the need for an increased literacy within student populations around the world. Literacy in this context not refers only to the ability to understand the meanings of (nonliterary) texts but also to the ability to use prior (scientific) knowledge and abstract problem-solving competencies to decode and understand every possible issue at stake in every possible future context. Because PISA links literacy skills to

economic growth and advocates international comparison, its testing results in the "key subjects" of reading, mathematics, and sciences stirred up heated public debates about the respective national education systems in general and about the curricula in particular.

In the PISA surveys of the years 2000, 2003, 2006, and 2009, Luxembourg achieved results significantly below the OECD average (http://www.men.public.lu). The government used the results to legitimize far-reaching reforms, which led to the introduction of a monitoring system (*Ministerium für Erziehung und Berufsausbildung* 2007) of pilot projects in teaching sciences and mathematics in 2003 *(Ministe`re de l'e´ducation nationale et de la Formation professionnelle* 2010, p. 38.) and of education standards in 2008 (*Ministe`re de l'e´ducation nationale et de la Formation professionnelle* 2008). The first (primary) school law since 1912 passed parliament in 2009, introducing cycles of learning, competence-oriented forms of learning and teaching, and a new evaluation system assessing students' goal achievements during and at the end of every cycle (Loi du 2009). Explicitly, these reforms were meant to ensure the competitiveness of the Grand Duchy as well as the European Union's capability to sustain economic growth in the context of its Lisbon Strategy (*Ministerium für Erziehung und Berufsausbildung* 2007), the goal of which was to "make Europe the most competitive and the most dynamic knowledge-based economy in the world" (Lisbon European Council 2000).

These developments affected the traditional Luxembourgish curricula in two major respects: In the aftermath of PISA, Luxembourg witnessed attempts to rationalize and centralize curricular discussions with the help of (international) experts, and saw the "scientification" of curriculum research and curriculum content. At first sight, both developments seemed to indicate a rather radical break with the past: Over the past two centuries, curriculum research in Luxembourg was almost exclusively initiated from within the schools, and a scientific or academic tradition of

curriculum research did not exist. Up until 2003, Luxembourg did not even have a university, a fact that had a profound impact on any kind of research in Luxembourg, which was mainly undertaken by private initiatives and learned societies until well into the 1980s (Rohstock 2012, p.3; Meyer 2009). Since the late 1950s, Luxembourg admittedly has developed approaches that can be described as empirical educational research "from below," for example, the *Institut Supérieur d'Etudes et de Recherches Pédagogiques* (ISERP) and the MAGRIP-Studies, two research initiatives that were supported by international policy agents and that drew on internationally promoted reform projects. Yet, all these groups only came to be publicly institutionalized and supported in the 1980s (Rohstock 2013). Due to the absence of institutionalized educational sciences, it was the Luxembourgish educational elite that dominated curricular discussions, first and foremost the teachers of secondary education. Via teachers' journals, educational theses, national commissions, and extensive negotiations with the ministries, it was mainly practitioners that set the tone of curricular discussions in Luxembourg.

These long-lasting and localized bottom-up processes in the making of the Luxembourgish curriculum can be considered outstanding in Europe. As a result of these close links between local curricular debates and national and international policies, it is necessary to introduce a broader notion of curriculum than the one used in the majority of scientific analyses in European and especially in the German-speaking countries (cf. the chapters of Tröhler and Horlacher/Vincenti, this volume). By taking a rather discursive approach to curriculum (e.g., including an analysis of parliamentary debates, teachers' journals, reports from teachers' conferences, and two newspaper journals with different political backgrounds), we will analyze the complex social negotiations underneath the official and highly normative curricular laws and orders. This approach enables us to

- focus on individual interests and the social processes that link these interests and integrate them into the syllabi (or not),
- put emphasis on the role of schooling as socializing environment, and
- both respond to and include curriculum research and "resistance theories" criticizing the lack of analysis of the "hidden curriculum" and of the practice of schooling itself[2] and its focus on the normative frame of curriculum. (cf. Giroux 2001).

Our emphasis is on the expectations and aims of different agents with regard to how to use knowledge in the construction of the curriculum, be it to reproduce the educational elite, to establish social differentiation or national homogeneity, to challenge or confirm the influences of the strong Roman Catholic Church in Luxembourg, or to address different social and political problems.

Our thesis is a twofold one: We will argue that while Luxembourg (especially since the 1950s) has tried to keep track with the "scientification" and rationalization of the curriculum as promoted by supranational policy agents, this attempt to follow international reform patterns was contradicted by national and local traditions inscribed into the curriculum and classroom practices prevalent at least since the founding of the Luxembourgish nation state in the early nineteenth century. As our historical account will show, there is no such thing as an objective and politically neutral "expert" knowledge, which national and international policy agents commonly refer to in the attempt to legitimize controversial education reforms.

We will proceed in four steps: First, we will briefly present key facts about the Luxembourgish school system and the curricular decision processes, and secondly, analyze the historical construction of the curriculum during the last two centuries. Thirdly, we will trace back

the curricular debates that took place during the Cold War and the reforms in mathematics and science education following the Sputnik crisis of the late 1950s. Here we will show that even during the Cold War era, which put the education system under heavy pressure, curricular traditions and notions of *Bildung* proved extremely persistent. Fourthly, we will think about what these results probably mean for the construction of the curriculum in the twenty-first century.

The Luxembourgish School System and Curricular Decision Processes

In school year 2010/11, Luxembourg had a total of 94,401 students, 81,733 of whom were enrolled in public schools (Ministère de l'Education nationale 2012, p. 12). The public education system[3] consists of *école fondamentale,* or primary school, followed by *enseignement postprimaire,* or secondary school.[4] *L'éducation différenciée,* or differentiated education, is offered for students with special learning needs or disabilities.

Luxembourg has a unique demographic make-up with 43.2 percent of its 511,800 inhabitants having a foreign nationality, and its schools reflect the diversity of the population (Ministère de l'Education nationale 2011, p. 104). Students of a foreign nationality made up 41.7 percent of the student population in school year 2010/11, with Portuguese students representing the largest foreign nationality at 23.1 percent of all students (Ministère de l'Education nationale 2011, p. 15, 16). School year 2008/09 marked the first year in which a majority of students in *école fondamentale* spoke a language other than Luxembourgish as their first language at home. As the 1984 language law established Luxembourgish, French, and German as officially recognized languages, the Luxembourgish school system incorporates all three of these languages.

Luxembourgish is the medium of communication for cycle one (the first two years) of *école fondamentale.* The focus shifts to German for cycles 2 to 4 of *école fondamentale,* with French being introduced in the fifth trimester of cycle 2. Learning languages is given high priority in the schools, which is reflected by the number of lessons per week dedicated to languages in *école fondamentale*.[5] Students also add a fourth language, English, during their secondary education.

The *école fondamentale* consists of nine years of study divided into four *cycles d'apprentissage,* or cycles of learning (Loi du 2009). Secondary education in Luxembourg consists of a *lycée* system, and students either attend an *école secondaire* (*lycée général*) or an *école secondaire technique (lycée technique*).

The *école secondaire* lasts seven years, provides general studies in humanities, literature, math, and natural sciences, and is designed to prepare students for university studies. The inferior classes focus on transitioning students from *école fondamentale,* and the main language of instruction is German, with the exception of the subjects of French and math, which is taught in French. In contrast, the superior classes are taught in French, with the exception being the subjects of German and English. In the fifth year of study at the *école secondaire,* students must choose to study in one of seven sections. At the end of the seventh year of study, students take their *examen de fin d'études secondaires,* a final exam that, if passed, allows them to receive their diploma and gain access to higher education.

The *école secondaire technique* prepares students for professional life, although it is also possible to access university studies after graduating from a technical school. The *école secondaire technique* lasts between six to eight years, depending on the student's course of study and degree of specialization.

The curricular documents from the National Archives and the National Library (altogether over 12,000 curricular sources) allow for a detailed depiction of curricular processes in Luxembourg and show the variety of agents involved in their construction: While the major school laws—the basis for the curriculum—are passed by Parliament (*Chambre des Députés*) after having heard the counselors of the government (*Conseiller de Gouverenement*) and either the Commission of Instruction (which is responsible for the control of primary education) or the teachers' conferences and the school headmasters of each secondary school (for secondary education), they leave various possibilities negotiating the curriculum flexibly. For primary education, many responsibilities to change and adapt the curriculum have been left to the local councils, which only have to submit an annual report to the inspectors (again passing a report to the ministry). Secondary Education is even more based on face-to-face negotiations between the ministry and the different schools. These complex processes can be seen in the triple structure of the ministerial correspondence, which not only exists between the ministry and the headmasters and teachers' conferences, but also between the conferences and headmasters of the different schools, and between the conferences and the special commissions of secondary teachers, which are only constituted if special problems are to be solved.[6]

The Making of the Luxembourgish Curriculum. Science, Roman Catholic Morals, and Social Differentiation in the Wake of the Nation State

At the beginning of the twentieth century, Luxembourgish newspapers and teachers' journals as well as celebratory speeches emphasized the increased societal importance of knowledge, yet

stretching its meaning to varying content. While stressing the significance of knowledge for the society of the Grand Duchy in general, the influential daily paper *Luxemburger Wort,* for instance, linked knowledge merely with *Volksbildung* (popular education), a concept that was intended for the education of the lower classes only. The notion of "knowledge" as used in the Luxembourgish society at the beginning of the twentieth century was closely connected to the needs of practical, national, and moral education:

> We are a people keen on education. The urge for knowledge and the joy of learning have gained ground; the rising social classes are as anxious about acquiring every kind of knowledge as never before. . . . Therefore we have to let in everything worth knowing about the Modern Age in our elementary school, as far as convenient with the aims and tasks of mass education, everything that is necessary and useful, the pleasant and comfortable; fine words and entertaining stories don't serve the interest of the new generation anymore; already at an early age it wants to achieve knowledge about the real world, to study the progress of understanding and make use of it.[7] (Meyers [Luxemburger Wort] 1911)

By contrast, in secondary education, especially in the *lycée classique,* the concept of knowledge was almost unknown. Here it was *scientia* that dominated the discussions, a term that many Luxembourgers equated with the German concept of *Allgemeinbildung* (general education) or *humanistischer Bildung* (humanist education) (Anonymous 1906). Other than knowledge, *Bildung* was understood as an end in itself, an ideal of a societal elite not in need of practical usability.

This distinction between "realistic" and pragmatic *Volksbildung* and "humanistic" *Bildung* found entrance in the Luxembourgish curriculum and has ever since structured the curricular debates. Closely connected to the construction of the nation state, it was inherent in schooling and

everyday practice and, over the centuries, became an unquestioned and idiosyncratic feature of the Luxembourgish school system. Therefore, while striving for national unity, the political authorities from the beginning have fostered differentiation: social and regional, in language teaching and in moral and science education.

Social and Regional Differentiation

Compulsory school attendance is one of the measures most often considered as strengthening national unity (Gellner 1995, p. 91). But while surely the aim of the Luxembourgish authorities was to unify the young nation, the very same law introducing compulsory attendance of primary schools in Luxembourg in 1881 also codified the possibility of regional differentiation, saying that "if local conditions indicate it, the local council can change the syllabus" (School law 1881, p. 374). With this, a very specific "localism" was worked into the Luxembourgish school system and the construction of the curricula that proved to be indestructible for the following century.

The authorities merely designed a model-syllabus that was modified and adjusted by each of the eleven cantons in Luxembourg (Seyler, [Kanton Wiltz] 1864). During the following century, the right of the local councils to adapt the syllabus to their needs remained strong, as can be seen in the syllabus of 1989. It prescribes in bold letters that the local council can add subjects to and remove them from the timetable, and that the local circumstances have to be taken into account. In addition to that, it schedules a specific timeslot *Objets et sujet divers* that can be filled differently by each school (Syllabus of 1989, p. 1).

The regional differentiation in the syllabi was also a tool for social differentiation: For example, the students in the suburban schools had, in contrast to the students in the city, special lessons in different school subjects, such as history and geography, at the expense of French, the

language spoken by the urban elite (*Lehrplan für die Primärschulen der Stadt Luxemburg* 1901, pp. 26–27). New subjects found their way into the curriculum, that per se allowed for local differentiation, such as local studies, (*Milieu local, Heimatkunde*), and object lessons (*Anschauungsunterricht*), which both were permanent parts of the curriculum at least until 1989. Both subjects were based on the study of the "direct environment of the children," dealing especially with local economy and administration. This was enforced by reforms at the end of the nineteenth century pleading for the primary school to become a "work school" (*Arbeitsschule*), which as a consequence led to an even stronger regionalization (e.g., Anonymous 1908) as demanded by the primary school teachers: "With vehemence, the local conditions have to have determining influence on the syllabus, as we were unmistakably taught by the past of our rural postprimary education [*Fortbildungsschule*]" (Pharus 1911, p. 269).

While in 1916 the upper primary teachers did not want their schools to become regional schools with predominant economy lessons in 1916, from 1936 onwards, they asked for an even stronger regionalization of the upper primary schools (Wagner 1936, p. 40). The suggestions for courses included agricultural or commercial accounting, chemistry, theoretical and practical horticulture and agriculture, mechanics, electricity, technology, mining, as well as courses for floor men, shop assistants, and construction workers. The new syllabus for upper primary schools of 1939 (the last before World War II) codified different contents of the natural sciences for different schools and classes, designing special agricultural, viticultural, artisanal, and mine worker courses for different regions (Syllabus of 1939, p. 151ff.). The textbooks used in the upper primary schools and *Fortbildungsschulen* also included different exercises according to the different regional circumstances (e.g., Luxemburger Lehrerverband 1925). This regionalization mainly took place in

the lower school branches, but not in higher secondary education, as classical *Bildung* was regarded as something universal.

The Luxembourgish school system is a highly stratified one. Not only the structure of the school system (including an elaborate tracking system) but also the curriculum includes a strong social differentiation. Although Luxembourg, under the heading of a socially inclusive policy, started to expand access to education beyond primary education at the end of the nineteenth century, the school law introduced separate school types for the lower classes somewhere in between primary and secondary education. This led to a dualism in secondary education—a dualism that found its linguistic representation in the terms of postprimary education (including the schools beyond primary school which were not secondary school) versus secondary education. The lower branches included in postprimary education, as well as the so-called industrial schools,[9] put greater emphasis on the actual needs of their students and the usability of knowledge. This was due to the increasing industrialization of the Grand Duchy. Social differentiation, which started in primary school (cf. Schreiber 2012) continued in higher education: at the end of the nineteenth century, only three percent of Luxembourg's students attended secondary schools, while postprimary schools taught up to about 20 percent (*Statistiques historiques* 1990). Secondary education prepared its students for studying at a university abroad, but postprimary education was homebound. Postprimary education reflected curricular patterns of the primary school, understanding education as a medium to prepare the students for practicing social and Christian virtues (School law of 1881, p. 374), whereas secondary schools followed German theories seeing *Bildung* as an end in itself that did not need any orientation to practical life. This influenced secondary education throughout the subject table, where history first and foremost meant ancient history, natural sciences contained cosmography and geology seemingly capable of sharpening the

students' aesthetic capabilities, and drawing included artistic drawing instead of technical drawing. Ancient languages occupied a huge part of the syllabus.[10] That they were generally taught in the first hours of every day is a telling constructing principle of the Luxembourgish curriculum (e.g., *Progymnase d'Echternach* 1889).

Language Education

Language education dominated the curricular discussions in Luxembourg at least until the 1960s and has stayed an important element of schooling in Luxembourg until today. Not only was the Luxembourgish trilingualism (Luxembourgish, German, and French) perceived as an important part of the Luxembourgish national identity and was thus made an essential part of all school curricula in Luxembourg, but foreign language education was also used as a matter of social differentiation: Secondary schools put the ancient languages at the core of their schooling activities. The dominance of Latin was not seriously contested at least until the 1960s. The students' libraries in the secondary school were filled with collections of ancient authors, while the postprimary schools more and more integrated English and French as essential parts in their curriculum. Moreover, the law prescribed an equilibrium between the two teaching languages, namely German and French (School law 1861, p. 80). Science education played only a marginal role.

Practical Knowledge

The emergence of specific subjects dealing with "realities" (natural history, history, and geography) in the late nineteenth century was tailored to the education of students in the lower school branches. The objective of the authorities was that the education of these students had to be linked with practical experiences made in their immediate environment. On the one hand, this was to guarantee

optimal job preparation; on the other hand, the authorities were aiming at the social and moral education of the future workers fearing for the autarchy and competitiveness of the small Luxembourgish state:

> From day to day, there are new inventions made in industry. . . . If our people are not prepared to utilize them, foreigners will come . . . and take away the most rewarding jobs. A state can only exist as long as its sources of income make up for everybody's aliment. It has to do its utmost to increase the production to its maximum. . . . This task will be facilitated if the state has an army of workers at its disposal, willing and able to work and produce and at once able to put inventions and improvements into practice.[11] (*Autorenkollektiv* 1916)

In 1902, the Luxembourgish Primary School Teachers' Conference passed Twenty Clauses on Scientific and Economic Education in Primary School. They pleaded to put scientific and economic education into the primary curriculum, "rightly appreciating the task of the elementary school [*Volksschule*] . . . which besides general education must have the aim of equipping youth with practical knowledge that they need for their later progress whenever possible"[12] (Schmit 1902, pp. 348–350).

Math education was thoroughly adjusted to national economic calculations, just as *histoire naturelle* (natural history)—the engagement with the entire flora and fauna (still a focal point in 1914) —was reduced to topics like "the field," acquainting the students with the basics of agriculture, or "in the soil" mediating essential knowledge for the steel industry (iron and steel and the origin and extraction of coal). In the upper primary school, we can find very similar developments, heading for the modernization of curricula: Initiated by the *Memorandum zur Reform der Oberprimärschulen* in 1916 the "traits of the modern upper primary school [should] be

1st In favor of the technologies of our modern time, 2nd With the technologies of our modern time 3rd Beyond school 4th Into life”[13] (Memorandum for reform of the upper primary schools 1916). The reform of 1939 aimed at orienting school closer to cultural, local, and economic needs, realizing demands for English lessons and for applied mathematics instead of “pure” mathematics.

Occurring within the discussions about useful education, first demands for an explicit civic education came up in mid-nineteenth century, again focused on the lower school branches. This civic education was by no means meant to replace religious education—the declared aim was the formation of the Christian cosmopolitan instead (Anonymous 1848, p. 3). Citizenship education very clearly concentrated on aspects relating to Luxembourg’s autarchy: its constitution, administration and justice, military, police, state security, and industry and commerce, but also on the improvement of primary education and the necessity of state taxes (Programm der permanenten Normalschule 1847, pp. 276f.). It was not until the twentieth century that civics found its curricular place as a specific subject: Luxembourg’s important school law of 1912 and the following syllabi introduced the *instruction civique* as obligatory subject in primary and postprimary education, while secondary schools introduced lessons in “public laws.” While the latter was concerned with Luxembourgish laws only, the former included much broader knowledge in “history, geography, economy, legislation and . . . industrial and commercial life of our country” (School law 1912, pp. 1072f.). Beside the topics of family, township and state, and laws and justice, the lessons were focused especially on state finances and economy. Teacher training also increasingly included civics as an examination subject (order of 14.03.1913), and even the school headmasters, the professors of the Normal School, and the primary school inspectors had to take an examination in civics (order of 09.01.1914).

Science Linked to Morals

The content of civics already shows an emphasis not only on knowledge but on moral education and character formation. Especially in the twentieth century, it focused more closely on combating social and moral problems by dealing with topics such as housing; hygiene/ health and nutrition (e.g., Bürgerstein 1914); alcoholism; industrial accidents; and moral and economic values of the industrial works, such as thriftiness, work enthusiasm, and cases of illness (e.g., *Autorenkollektiv* 1916). And again, the Luxembourgish school system differentiated between which kind of moral and social education was needed for which part of the population: discussions about girls' education, for example, considered female schools to be much more mindful of moral and religious education (cf. Schreiber 2012), and most of the above-mentioned topics like hygiene, alcoholism, and thriftiness were nearly exclusively addressed in mandatory education. It was the educational elite, that—within the curricular discussions—apparently reacted to a perceived moral deficit in the lower social classes.

In Roman Catholic Luxembourg, the concept of usable knowledge mediated in school was apparently not limited to what the Church referred to as "materialist education" in this world, but also to prepare students for the next world, since, as the headmaster of the Normal School put it in 1878, the aim should not be a pure materialistic education for Cosmopolitan Citizenry and Humanity, and should not only aim at life on Earth, and prepare children for their later professions, but also prepare them for the after-life (Müller 1879, p. 247).

Curricular Developments in the Cold War Era, 1950–1990

The Sputnik Crisis and its Perception in Luxembourg

The so-called Sputnik shock (1957) initiated a heated debate on schooling and curriculum reform in the Western world, and Luxembourg was no exception. Sputnik symbolized a threat to the security of the Western world and a challenge to the belief in the superiority of science and technology in the United States and Western Europe. And it played a very important role in the educational reform movement, as many argued that the perceived "technology gap" between the Soviet Union and the "free world" could only be bridged with the help of better educated students and especially with the help of better mathematics and science curricula.

While in the United States the educational debates of the 1950s and 1960s were already under way when Sputnik was launched by the Soviet Union, the technological challenge coming from a communist country hit Western Europe largely unprepared. In the United States, far-reaching educational reforms were undertaken by educators, scientists, and mathematicians with the public supporting their efforts, but the reactions in Western Europe were much more restrained. Nevertheless, the Soviet satellite did fuel the movement for curriculum reform in Europe and posed a challenge for the mostly conservative teachers and teachers' unions in the Grand Duchy of Luxembourg. While many in the United States and also in Western Europe tried to use Sputnik as an event touching off a curriculum revision and putting mathematics, technology, etc. on the educational agenda, conservative and more cautious educators in Luxembourg believed the Sputnik debate would endanger their predominantly humanistic educational ideal.

The most important daily newspaper in Luxembourg, the conservative Roman Catholic *Luxemburger Wort,* saw the Sputnik satellite as a technologically superior product of a politically and ethically inferior system. Sputnik was the frightening symbol of the feat a totalitarian country

like the Soviet Union could accomplish, simply because they were able to devote large resources to one aim only while the "free western world" was squandering its possibilities, not exactly knowing where to go. The conclusion for the *Luxemburger Wort* was clear: Western Europe had to find ways of working together more closely: "The signals from space have no other meaning for the free countries of Europe than: Unify, unify, unify!" (LW October 16, 1957, p. 3).

This process of cooperation was to strengthen the technological and scientific powers of the free European countries. It was to be complemented by a new era of education in Luxembourg, enabling the small Grand Duchy to make its contribution. School reform and curriculum reform in particular were considered a means of "intellectual self-defense" against the threats of Soviet "slavery" (LW November 19, 1957, p. 3). This "intellectual self-defense" did not mean that everybody should profit from educational reform, but that mainly the higher branches of secondary education needed a complete overhaul. While the American educational discussion quickly concentrated on the importance of new mathematics and science curricula, the Luxembourg debate was broader, less focused, and trying to find a compromise between the notions of classical education (*Bildung*) and the need for new curricular concepts. On the one hand, the Luxembourg Socialists (and their party the "LSAP") stressed the importance of mathematics and science education supporting curricular reforms similar to those in the United States (Tageblatt December 11, 1957, p. 8); the Conservatives, on the other hand, demanded the teaching of ethics in schools fearing that the ideal of humanist education was threatened by the "cult of technology" (LW February 10, 1958, p. 3). For the culturally and politically dominant Conservatives, it was clear that technological and scientific progress in general posed new questions in the field of education making a reform necessary, but they did not want to go the "American" way. Instead, they stressed the dangers of new technologies and the importance of educating the future generation so that they

could handle these technologies in a responsible way. The Minister of Education, Pierre Frieden (CSV), particularly stressed the importance of ethical and religious education enabling the young to cope with the challenges of the new times (LW February 10, 1958, p. 3). And at a 1965 OECD colloquium held in Luxembourg, the CSV Minister of Science Pierre Grégoire, a national literary figure, refused to fully indulge in the scientific hyperbole proffered by Alexander King, the OECD Director for Scientific Affairs and Grégoire's comrade-in-arms on the conference's international podium. Under no circumstances, Grégoire told the more than 80 delegates gathered from all over the world, should scientific research pursue a purely rationalistic understanding of science, but instead, it must always include "humanistic, philosophical, and ethical dimensions" (Grégoire 1965). But the Conservatives also made clear, that science education had to become more important in Luxembourg. In 1958 Pierre Frieden proclaimed: "Those, who have the best scientists will win the Cold War. Those, who have the best scientists will win the economic war!" (LW February 27, 1958, p. 3).

Science for the Elite: Curricular Reforms in Secondary Schools, 1950–1970

Taking this "call to arms" literally, Luxembourg participated in international curricular activities fostered by supranational organizations like OECD and UNESCO since the late 1950s. These activities in general followed a new scientification paradigm that was on the rise at least since the turn of the century, but in the threatening atmosphere of the Cold War era, gathered speed. Together with cognitive psychologists—the rising stars in education science since the 1960s—former military experts like the Swede Torsten Husén or the Americans Jerome S. Bruner and Jerrold Zacharias engaged in curricular debates and tried to rationalize and systematize schooling

along the lines of military and weapon systems, which they had helped to develop in WW II (Rudolph 2002). The alliance of operation research, which was used by the Allied Forces in World War II, and cognitive psychology had significant effects on curricula debates all around the world. Whether it was physics, mathematics, geography, or biology, the numerous study groups for the reform of curricula—which in the 1960s sprang up overnight and were headed by leading scientists (Pinar 2008)—fostered abstract problem solving skills, logical operations, and general understanding of subject matter rather than the learning of facts. In the future, just as it had taken place in scientific research during and after World War II, teaching would be oriented to mandatory target goals. Structure was the new magic word, and schools had to subordinate themselves to this principle. The teacher had to furnish the student with knowledge structures, a process that psychologist Jerome Bruner called "scaffolding." Scaffolding, as David Olson, a student of Bruner, remembered, "was the application of an engineering model to pedagogical practice. The teacher constructed a scaffold that could be used to support the efforts of the learner to construct his or her own understandings. Once complete, the scaffold could be removed and the learner's own mental structures would sustain understanding and enquiry" (Olson 2007, p. 45). According to this perspective, the function of the school was to transform the human mind into a decoding system that could break down every imaginable code that might arise in a future environment (Brunner 2006). In this way, universally applicable and future-directed ways of thinking found their way into curricular discussions, and in that place, they suppressed traditional present-oriented, spatially, historically, and culturally contextualized subject matter (Rohstock and Tröhler 2012).

In the case of mathematics, a new curricular movement called New Math evolved in the 1960s and rapidly spread in the Western hemisphere. With its highly formal and abstract language, it attracted scientists and mathematicians from all over the world: addition, subtraction, and

multiplication became “commutative, associative, and distributive axioms,” a sum was a “union of sets” and a subtraction an “additive inverse,” while a triangle had to be defined as “the union of three noncollinear points and the line segments joining them” (Sommer 1984, p. 32). As was the hope of many protagonists of the movement, this abstract coding of mathematical language would foster scientific thinking within the student population. The students should become scientists and student-researchers with an active capability for scientific literacy, a term that today is widely used in the context of PISA but came up as early as 1958 (Millar 2008, p. 43). In 1965, Tom Lehrer, a well-known American mathematician and artist, wrote a satirical song that made fun of the general manner in which mathematics from now on should be taught in schools: “In the new approach,” Lehrer sang winking, “the important thing is to understand what you’re doing rather than to get the right answer.”[14]

Luxembourg was one of the first nations to participate in these international curricular activities. In 1949, a standing National Commission for Cooperation with UNESCO was founded in Luxembourg. The Commission not only worked closely with high-level delegates, experts, and other national representatives of UNESCO who made regular visits to the Grand Duchy, but it was also called upon to actively cooperate with other international bodies, specifically the OECD and the Council of Europe. The first president of this commission was a well-known Luxembourgish economist and historian, Albert Calmes. Many of its subsequent presidents also functioned as political advisers in their home countries. As a UNESCO member, Luxembourg even went on to launch significant activities of its own: in 1965, 1969, and 1973, the Grand Duchy organized colloquia in Echternach (a town in the east of the country), together with the International Commission of Mathematics Education, which—very much in keeping with the “New Math” movement—dealt with reforms in school mathematics curricula. Luxembourg also convened

conferences among the Benelux states, which served as a venue for experts active in UNESCO to take steps for revising old textbooks and, under the aegis of the international organization, organized teacher training seminars, especially in the fields of mathematics and geography (Rohstock and Lenz 2012).

Luxembourg was also involved in international curricular developments by virtue of its membership in the OEEC/OECD. In 1959, delegates from Luxembourg, namely the mathematics teachers Lucien Kieffer and Marcel Michels, took part in the famous seminar on "New Thinking in School Mathematics" in Royaumont organized by the OEEC and chaired by the renowned American mathematician Marshall Stone (OEEC 1961, p. 215). With the help of numerous other delegates from the United States (among them were popular scientists such as Albert W. Tucker, Robert E. K. Rourke, Howard F. Fehr, and the founder of the New Math Movement in the United States, Edward G. Begle) the conference was regarded as the breakthrough moment for the "New Math" movement in Europe and had a significant impact on mathematics curricula, even in nations that did not send their own delegates (Sriraman 2008, p. 202).

The conference in Royamont was followed by two other conferences in Dubrovnik (1960) and Athens (1963), both organized by American scholars. All these meetings saw the distribution of books and curricular materials designed for the implementation of New Math in schools all over Europe that even gave examples of how to utilize the new approach for the teaching of physics (Gispert and Schubring 2011). In the years following, New Math, as negotiated in Royaumont, became part of the curricula in many Western countries (Moon 1986).

Not only as delegates of international organizations were teachers of secondary schools in Luxembourg engaged in international curricular reform debates. Being so close to France, a hot spot of the New Math movement in the 1960s, there also was a lively exchange especially between

mathematicians of the two neighboring countries (Willems and Thill 1953). In 1968, the French government appointed a commission chaired by the famous French mathematical physicist André Lichnérowicz. This commission had to "elaborate official programs for the whole curriculum, which were gradually implemented in the classrooms from 1969 to 1971" and were very similar to the reform measures proposed by OECD (Gispert and Schubring 2011).

Luxembourg adopted at least parts of this reform, above all by introducing new French textbooks and instruction materials in secondary schools all over the country (Dupong 1970). Tellingly, the last high schools with the least reform efforts and only modest concessions to the New Math movement were the higher secondary schools for girls (*Réforme de l'enseignement des mathématiques,* n.d.). With international support, reform-oriented teachers of secondary education hoped to put an end to the supremacy of language education in the classical divisions of higher secondary education. At the end of the 1960s, the commission of instruction for mathematics urged the ministry to upgrade mathematics and to extend classes in the schedule especially of the *lycée classique.* With the help of biology, physics, and geography teachers, these pedagogues also called for an early beginning of science and mathematics education in the lower classes of secondary education and asked for a modernization that would leave no room for the memorizing of facts but would foster intelligent thinking and abstract problem solving capabilities (Schaack 1969). From the beginning, the teachers engaged in the reform movement were quite sure that they would have to face resistance from within secondary school. They therefore tried to convince their colleagues that it was inevitable for every secondary teacher to get involved with New Math as the new approach would pave the way for Luxembourg to become a modern country at eye level with the USSR (President of the mathematics commission 1970).

The reform efforts indeed met great resistance from within secondary education. The new textbooks from France seemed "suspect"[15] (Dieschbourg 1969) to many teachers. They found it also difficult to mediate the highly abstract language in mathematics classes. The time needed to explain what students should do apparently exceeded the scheduled lesson (*Requête des titulaires des cours de mathématiques,* 1968). In the end, modest adjustment in mathematics and science curricula were made in secondary education, but no radical reform took place. As our quantitative analysis shows, Luxembourg merely witnessed minor changes in the number and distribution of mathematics and science classes in the syllabi of secondary education until the 1990s. Biology and geography teachers, for instance, continuously complained about further reductions of classes in favor of language instruction (President of the biology commission 1972). Also, the reforms merely affected secondary education. Still, in the 1980s, primary schools did not have special classes for natural sciences (Courrier de l'Education Nationale, 1964; President of the biology commission 1972). For a long time, biology education was a privilege for students of secondary schools only.

Another highly regarded and typical reform effort of the 1960s and 1970s suffered the same fate: the efforts to introduce teaching and learning technologies into the Luxembourgish classrooms. As a first analysis has shown, schools in Luxembourg indeed got the equipment needed for the new instruction methods, but secondary schools were preferred. Not only did lower school branches have fewer facilities for the new teaching technologies, but also schools in the country were left with fewer resources than Luxembourg City. Moreover, many secondary school teachers were suspicious of the new techniques and never warmed to modern teaching methods. In the end, the reform was never fully implemented (IP 3132; IP 2571; IP 2728; IP 3189; IP 2308; IP 1940).

“Science” for the Masses: Curricular Reforms in Primary and Postprimary Education, 1950–1990

While in secondary schools modest reforms in science education and mathematics took place in the 1960s and 1970s, in 1986, still, the Commission of instruction underlined the special moral mission of education in primary schools. According to the wishes of the commission, health education, hygiene, and civic information (*informations civiques*) had to gain more importance. Questions of “modern life,” such as sex education, traffic education, and security education were deemed as crucial as was the teaching of “human and moral values”[16] (Anonymous [*Commission d’Instruction*] 1986).

Mathematics according to the New Math movement or science education as propagated by international organizations were not included in the syllabi for primary schools in Luxembourg. Until the 1980s, the syllabi did not know special classes for natural sciences like biology, physics, or chemistry. The subject matter had to be covered by classes in German, object lessons (*Anschauungsunterricht*), or local studies (*Heimatkunde, milieu local*).

In 1989, the newly created subject *Eveil aux sciences* (scientific awareness) was introduced in primary school. The lessons were clearly shaped by moral standards. The explicitly established general aim was to bring about a principal and positive attitude[17] as well as a “value-oriented active analysis of the children’s natural, social environment and the one which has been created”[18] (Syllabus of 1989, Chapter Eveil aux Sciences, p. 2). Therefore it is not astonishing that most of the topics covered in ethics (*moral laique*) can also be found in the much more detailed program of *Eveil aux Sciences.*[19] With this new subject, both science education and moral education were newly legitimized.

Catholic Moral and Sex Education

In the syllabus of 1979, sex education was prescribed as mandatory for the first time ever in Luxembourg (syllabus of 1979); however, the classes existed only on paper. As the *Lëtzebuerger Land* still complained in 1986,[20] teachers were not urged to give lessons in sex education, and if they sometimes acted according to the syllabus, the lessons were characterized by the Catholic moral concepts that were widely spread in Luxembourg (Lëtzebuerger Land June 27, 1986, p. 3).

In 1976, the commission of instruction (*commission d'instruction*) declared that the aim of sex education was not to teach anatomical and physiological knowledge, but that sex education should necessarily contribute to "develop human values" instead ("*à développer des valeurs humaines*") (*Commission d'Instruction* 1976). The first sex education brochure that was published in 1979 by the socialist-led Ministry for Family Affairs was not further distributed after the appointment of a new conservative minister in the same year. Instead, in 1983, it was replaced by the sex education pamphlet "*Partnerschaft und Liebe*" (partnership and love) (Goerens et. al 1984), which was catholic in character. Its primary objective was "to encourage young people to settle down to a harmonic family life."[21]

The attempt of the Luxembourg teacher union to create new factual guidelines for teachers in 1985 failed due to massive criticism from the ministry and the commission of instruction, but also from Catholic associations like the *Centre de Pastorale Familiale.* Major contentious issues were the representation of marriage and family life, the approach to traditional role allocations, as well as the relationship of sexuality to love and to the Christian and societal context. The commission of instruction criticized in a strictly confidential statement that the guidelines avoided any value judgment and that the reader, therefore, could mistake love for sexual pleasure.

Moreover, marriage and family were hardly highlighted so that living together as an unmarried couple could be thought of as an alternative or even as an equivalent to marriage (*Commission d'Instruction* 1985).

The criticism of the *Centre de pastorale familiale* was very similar: they criticized that the chapter about nudeness could violate the boundaries of intimacy and shame; sexuality and lust were put on a level with love: "the wish to be respectful and tolerant—as so often—results in the avoidance of questions of norms and values"[22] (*Centre de Pastorale Familiale* 1985). The *Pastorale familiale* further criticized the missing "context of mutual help, acceptance, devotion, giving oneself to each other" and the ignorance of religious topics like "the consciousness of creation or orientation to the God of Love"[23] (Ibid.). Although the paper was written by scientific experts (psychologists and sexologists), who at the same time held responsible positions (e.g., as counselor of the government), their criticism is clearly inspired by catholic values.

Autarchy, Practice, and the Capacity to Act Regarding Everyday Life

The syllabus of 1989 for the instruction in *Eveil aux Sciences* put practical skills (*Lebensbezogenen Handlungskompetenzen*) on a level with "scientific basic knowledge" (*wissenschaftliches Grundwissen*) (Syllabus of 1989, Chapter Eveil aux Sciences, p. 2). By prioritizing the "principal of visual perception" and the "direct encounter with the environment," it continues the tradition of "realities" of the late nineteenth century. In fact, the principal of visual perception was the same in the late nineteenth and the late twentieth centuries. This becomes clear when comparing the arrangement of *Eveil aux sciences* in six so called "concrete fields of experience" to former syllabi (e.g., programs of the upper primary schools 1878–1896, Syllabus of 1939). The first field of experience, "Plants and Animals," picks up established aspects of the primary school syllabus in

the area of botany and zoology. Hence, it draws on the former subjects "Natural History" (*Naturgeschichte*) or "Origins of the Natural Sciences" (*Anfangsgründe der Naturwissenschaften*).

The second field, "Man and Nature," adopts the topics of health education and hygiene, which had become more and more prominent since the 1920s. It also deals with questions of environmental protection, nutrition, and prevention of dependence (on alcohol and drugs). Most of the "trendy" issues like television and leisure, consumption and advertisement, as well as sex education became part of the third field, the "social field of experience." The adaptation to national economic conditions is another important focus there. The syllabus refers to "Social Experiences," "Sex Education," and "Public" as well as "Media and Consumer Education." These parts mainly include topics that had formerly been part of subjects like history, geography, and civic instruction. They also cover specific Luxembourgian issues like "children of foreigners in our country" (Syllabus of 1989, Chapter *Eveil aux Sciences*).

The topics of the third and sixth field of experience also demonstrate the importance of the Luxembourgian economy, which since Industrialization had become important part of the national identity (cf. Schreiber 2013). The most locally oriented fields are the fourth and fifth ones, focusing on "space" and "time." Issues like "participating in traffic," "our village," "our quarter," or semiannual core themes like "our commune" arrange the analysis of local circumstances in an interdisciplinary perspective (Syllabus of 1989, Chapter *Eveil aux Sciences*). Landscape and environment are addressed as well as their historical development, administrative procedures, and the community as an institution. As science in the syllabus of 1989 is equated with practical skills and the capacity to act regarding everyday life, it clearly differs from science education and abstract problem-solving competencies as propagated by international organizations.

Social Differentiation: "Science" and "Technology"

This practical relevance of science education in the primary school and the complementary classes defines a social differentiation that is rather typical of Luxembourg (cf. dualism between secondary and postprimary education). The *Initiation technologique,* as prescribed by a guideline of the *Commission d'Instruction* of 1984 in the complementary classes,[24] was explicitly not supposed to be scientific, but technical:

> "School is supposed to make sense of the world and to mediate to the students all the knowledge, skills and attitudes needed. World for the student means first and foremost his surrounding world, that is not structured by scientific disciplines, but by spheres of life: Family, playing activities, school, job, traffic, weather, housing etc. . . . . The surrounding world familiar to the students . . . provides the best conditions for an instruction, in which inventing, planning and constructing are the preferred working methods."[25] (*Instruction ministerielle* August 6, 1984, appendix)

This terminology follows the German distinction between science and technology (Ropohl ca. 1986) and draws a clear line between technical education in the complementary classes and scientific education in secondary schools:

> "The sciences primarily result from the thirst for knowledge, they ask for causal relations. Technics serve to satisfy human needs, they are final, they are oriented towards final aims. Typical working methods of the sciences are exploration, analysis and experiments, working methods of technics are invention, planning and constructing."[26] (Ropohl ca. 1986, appendix to the Luxembourgish draft)

In sharp contrast, scientific education in secondary schools was of a scientific rigor that directly linked subject matters to the respective academic disciplines. Essays of secondary teachers,

for example, dealt with the introduction of gel chromatography in secondary education (Anonymous 1972), spheric trigonometry (ANLux IP 2159 [1971]), the introduction of atomic and nuclear physics (ANLux IP 3293 [1960]; IP 2683 [1961]), and relativity theory (ANLux IP-2512, [1973]). Even the adaptation of highly specified scientific models and processes, such as the chains of Markov and special atomic models, are covered by these theses. The moral contents so typical for primary education and the complementary classes are not to be found in secondary education.

PISA—the new Sputnik? Curriculum Debates in Luxembourg in the Twenty-First century or Why Tomorrow Never Dies

The PISA results of the year 2000 were publicly regarded as a second shock to the educational system in many Western European countries, with Luxembourg, once again, being no exception. The output-oriented studies seemed to show that the Luxembourgish school system produced mediocre results at best (especially in the field of mathematics) and that the language-oriented curriculum was a severe challenge for the large migrant population. With a high number of foreign residents and its trilingual tradition (Luxembourgish, German, and French), Luxembourg's educational system was (and is) facing huge challenges. Following the PISA results, integrating immigrant children into the trilingual education seems to be the biggest one. This problem has, of course, been known for years. But it needed the PISA shock—where Luxembourg found itself ranked worse than all of its fellow Europeans—to get a major discussion going.

Despite this discussion and unimpressed by OECD pressure and recommendations, the Luxembourgish Parliament rejected the OECD-driven idea of a school system with a stronger

differentiation between German and French. The government feared that a two-track system would endanger the nation's unity in the medium term (Geyer 2009, p. 9). But this was not the only OECD-driven idea to be rejected by the Luxembourgish authorities: They were also reluctant to the hyperbolic debates about a better science and mathematics education so typical for the twenty-first century. As our quantitative analysis shows, in fact fine arts have gained ground in the Luxembourgish curriculum since 2000/2002, and philosophy was introduced as mandatory subject in secondary education in 2002.

The Luxembourgish government nevertheless used the PISA debate to initiate several reforms that probably otherwise would not have been realizable. The rapporteur of the *Commission de l'Education nationale et de la Formation professionelle* affirmed this assumption quite frankly in his report for the parliament: "I won't hesitate to claim that the international comparisons paved the way for the reform of the school law from 1912" (LW January 20, 2009, p. 275). The education minister commented the bad PISA results of 2009 by stressing the importance of these reforms that were already on their way: "These results provide confirmation that we must consistently implement the reforms" (LW December 7, 2010). PISA results initiated a heated debate about the country's schools and educational system, which in 2009 led to the first reform of the (primary) school laws since 1912. It introduced the *école fondamentale,* superseding the old *école préscolaire.* It consists of nine years of study divided into four cycles of learning (Loi du February 6, 2009). The first cycle consists of one year of optional education followed by two obligatory years, and the other three cycles last two years each. To pass from one cycle to the next, students must master the *compétences,* or skills, required by that particular cycle. These skills are designed to move students beyond the rote memorization of facts, thus enabling them to apply knowledge "in the real world."

While the primary schools were reformed in 2009, the reform of secondary education is still on its way. The Luxembourg *lycée* system is likely to undergo a major reform within the next few years. The current system is largely based on the 1968 law, which reformed secondary education (Loi du May 10, 1968). Reasons underlying the will to reform include meeting the needs of an increasingly diverse and heterogeneous population, and responding to the results of the 2000 PISA tests. The main components of the proposed reform include introducing a tutorial in years seven and six of *école secondaire* to help students' transition from *école fondamentale,* offering more specialization in the *classes supérieures,* and reorganizing both general and technical l*ycées* into two big domains. In *école secondaire,* the two domains are *lettres, arts et sciences humaines* and *sciences économiques et sciences naturelles.* In *école secondaire technique,* the two domains are commerce and communication and sciences and technologies. Finally, in the second-to-last year of both regular and technical *lycées,* students undertake a *travail personnel* meant to show that they have developed the necessary skills to succeed at the university level. The introduction of the proposed reforms into the legislative process is expected to occur in April 2013. The reform most likely will not change much regarding the science curriculum though. Science teachers still see their subject as standing in the "shadow" of the language and arts dominated curriculum (LW May 4, 2009, p. 10; also see quantitative analysis in the appendix).

While the Sputnik debate was used by the powerful conservative representatives of the Luxembourgish educational system to promote a rhetoric of moral reformation in an uncertain age of technology and did not really change much within the curriculum of the country, it is yet uncertain how the PISA studies will affect the Luxembourgish curricula and the school system as a whole. The initiated reforms tackle some of the problems with the immigrant population and offer weaker students more help. But the Luxembourgish curriculum still stays language dominant, is a

display of a highly stratified school system, and apparently is able to resist international attempts to strengthen the natural sciences in school curricula (see quantitative analysis in the appendix). Expert knowledge, as produced by the PISA studies, seems to be highly effective on a discursive and policy level only. The future vision of global scientific literacy, which was promoted in the context of Sputnik as well as in the context of PISA, seems to be immensely attractive for national and international policy actors. Tomorrow never dies. But also, to say it with language from the Beatles, tomorrow never knows.

Abbreviations

ANLUX = National Archives of Luxembourg

IP = Instruction Publique

SAUL = School Archive of the University of Luxembourg

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