



# **INTRODUCTION OF FORMAL CALCULATORS INTO MATHEMATICS TEACHING**

## **AT THE EUROPEAN SCHOOLS**

**PRESENTATION OF WORK  
BY THE MATHEMATICS COORDINATION GROUP**

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Coordination Group.**



# **THE EUROPEAN SCHOOLS**

## **INTRODUCTION OF FORMAL CALCULATORS**



## **THE EUROPEAN SCHOOLS (ES)**

- **Origin of the ES.**
- **Legal status of the ES.**
- **Development of the ES.**
- **Study cycles of the ES.**
- **Educational principles of the ES.**
- **Linguistic sections of the ES.**
- **Harmonised programmes of the ES.**
- **The European Baccalaureate.**
- **Administrative bodies of the ES.**



## ORIGIN OF THE ES

- **1953: First ES in Luxembourg for children of CECA officials.**
- **1957: Signature of a protocol by 6 EU founding countries, the key principles of which are:**
  - **same programmes for all pupils,**
  - **teaching in the maternal language,**
  - **teachers seconded from the countries involved,**
  - **national inspection system and**
  - **mutual recognition of level achieved.**
- **1959: First European Baccalaureate recognised for all signatory countries of the protocol.**



## **LEGAL STATUS OF THE ES**

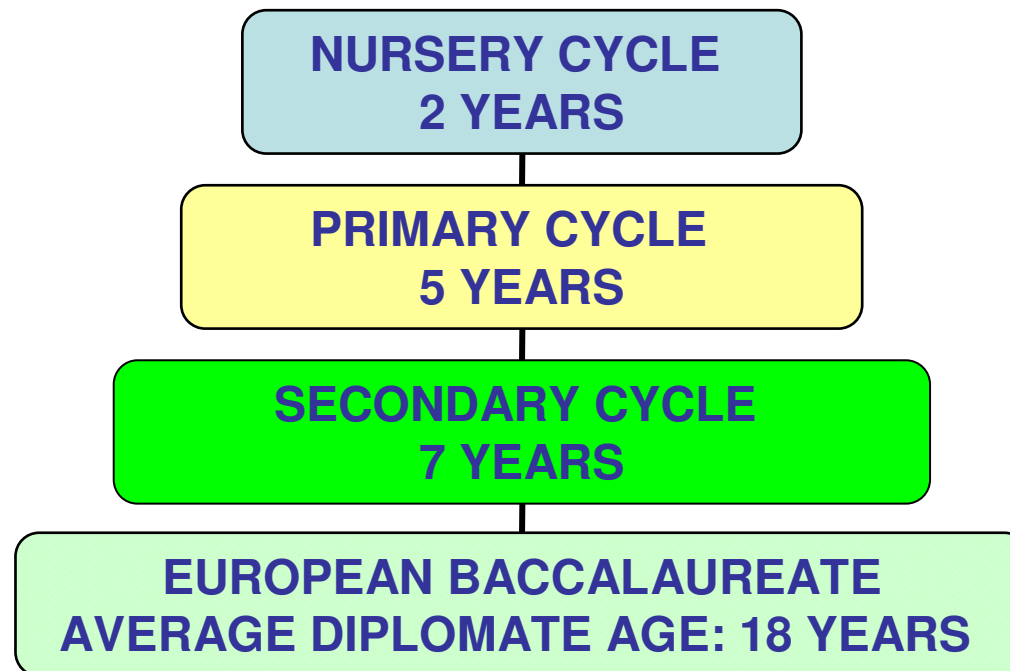
- **The ES are designed mostly for children of staff from the community institutions.**
- **They are official teaching establishments controlled by Member State governments.**
- **They have the legal status of a public institution in each of these countries.**
- **They are governed by an inter-governmental protocol.**
- **The Convention defining the status of European Schools is ratified by all Member States of the European Union.**



## DEVELOPMENT OF THE ES

- The success of the ES educational model in Luxembourg led the EU and Euratom to open 19 type I and type II ES in succession in 12 EU countries.
- In these schools
  - more than 21,000 pupils
  - spread between 15 different linguistic sections
  - are taught by 1500 teachers
  - from over 25 different countries.
- The number of diplomates in 2007 has risen to 2000.
- The opening of new ES is intended in the coming years and the senior managements predict a constant increase in the number of pupils.

## CYCLE STUDIES OF THE ES

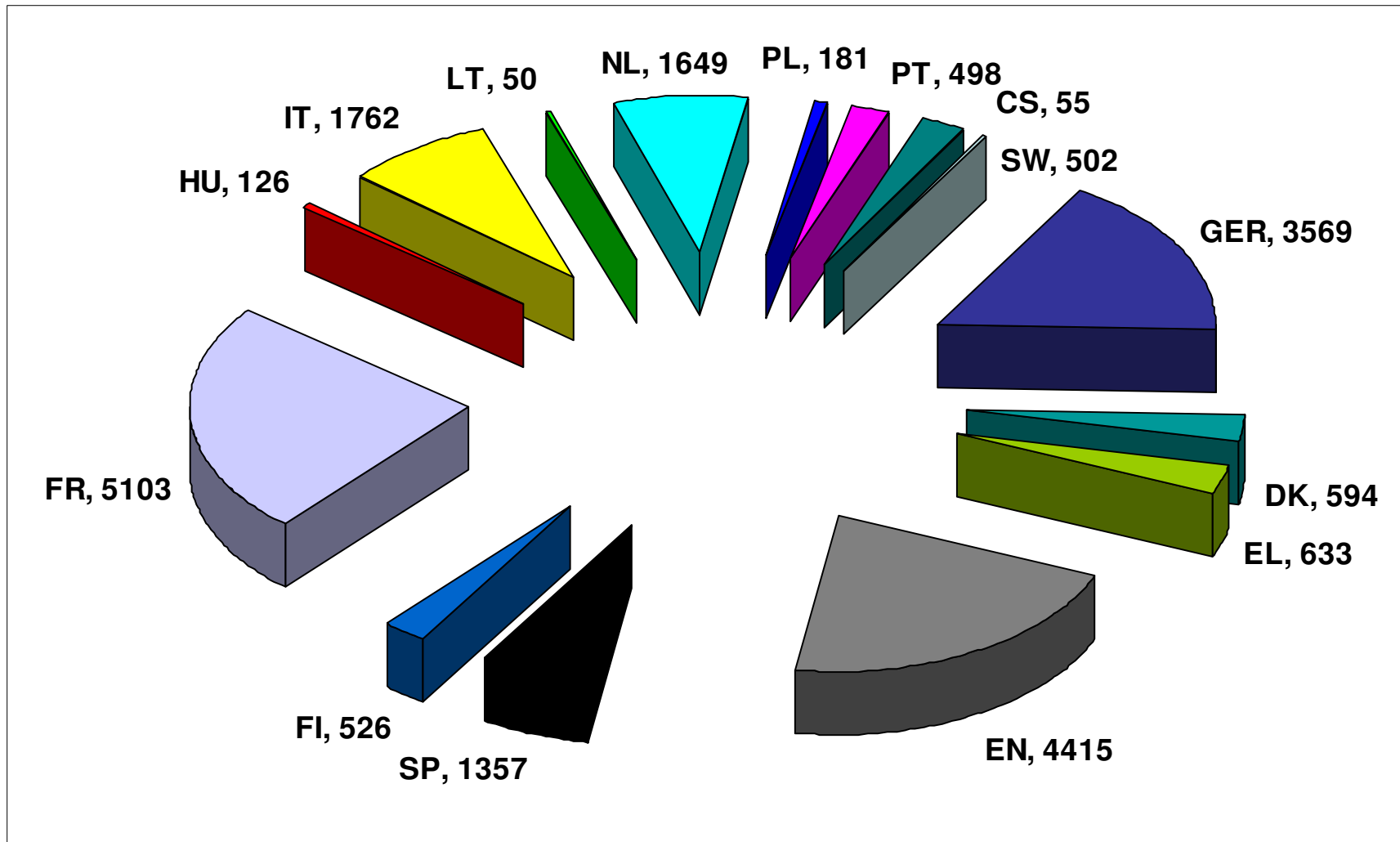




## **EDUCATIONAL PRINCIPLES OF THE ES**

- **Teaching is given in the official languages of the EU.**
- **Studying a first foreign language is compulsory for the first primary class until the baccalaureate.**
- **Studying a second foreign language is compulsory from the second secondary year.**
- **A third foreign language can be studied from the fourth secondary class.**
- **History and geography alternate in first foreign language from the third secondary class.**
- **Sciences and mathematics taught in mother tongue.**

## LINGUISTIC SECTIONS OF THE ES





## **HARMONISED PROGRAMMES OF THE ES**

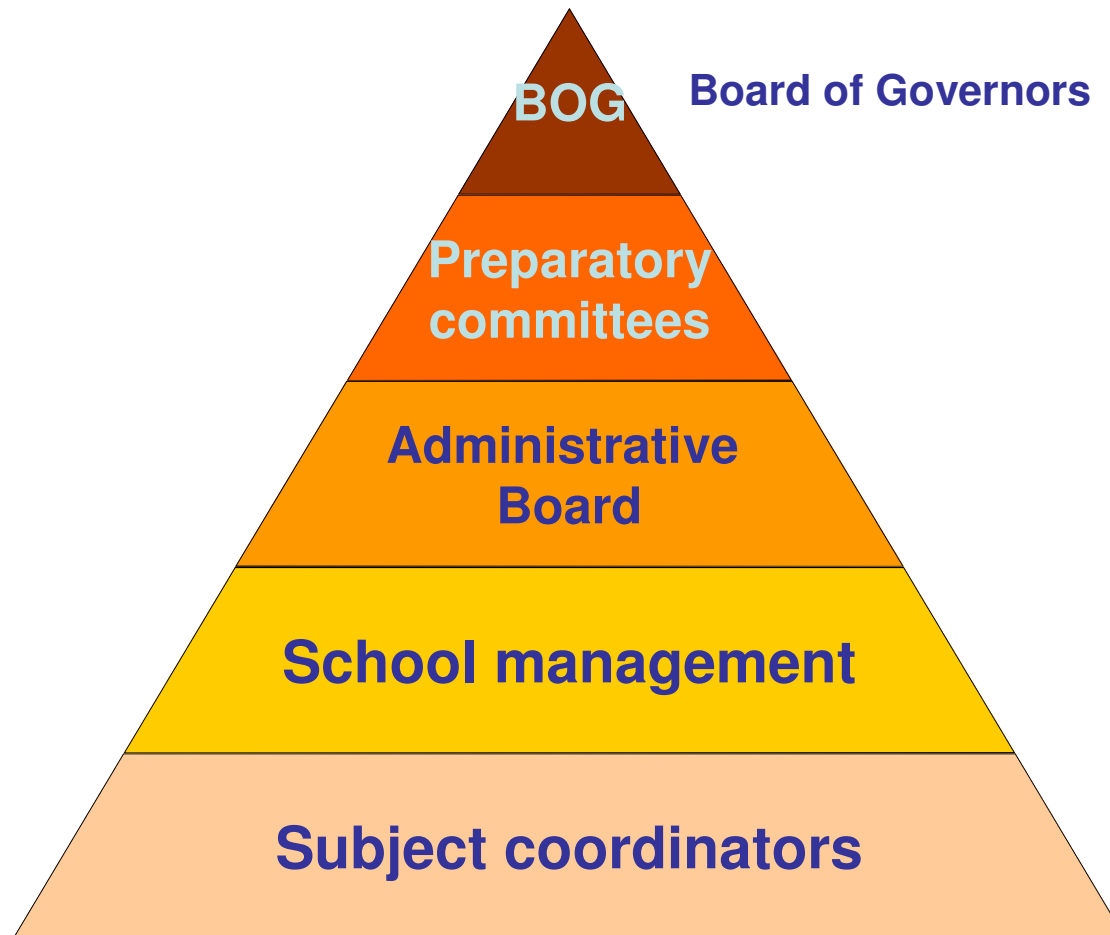
- **The educational programmes for all of the linguistic sections are identical and subject to the same requirements.**
- **All of the programmes of the different sections prepare for the same examination: the European Baccalaureate.**
- **The programmes must meet minimal requirements for all member countries of the EU.**
- **The programmes are constructed after negotiations between national experts and the ES Inspection Council.**
- **These programmes are approved by the Higher ES Council.**



## THE EUROPEAN BACCALAUREATE

- **The European Baccalaureate is a centralised examination and all of the pupils sit the same examination at the same time.**
- **The diploma is recognised in all countries of the EU and in a number of other countries.**
- **The European Baccalaureate comprises:**
  - **5 written examinations in which the maternal language, first foreign language and mathematics are compulsory for everyone.**
  - **4 oral examinations in which mother tongue and first foreign language are compulsory. Depending on the options chosen, mathematics may form part of these examinations.**

# ADMINISTRATIVE BODIES OF ES





# INTRODUCTION OF FORMAL CALCULATORS

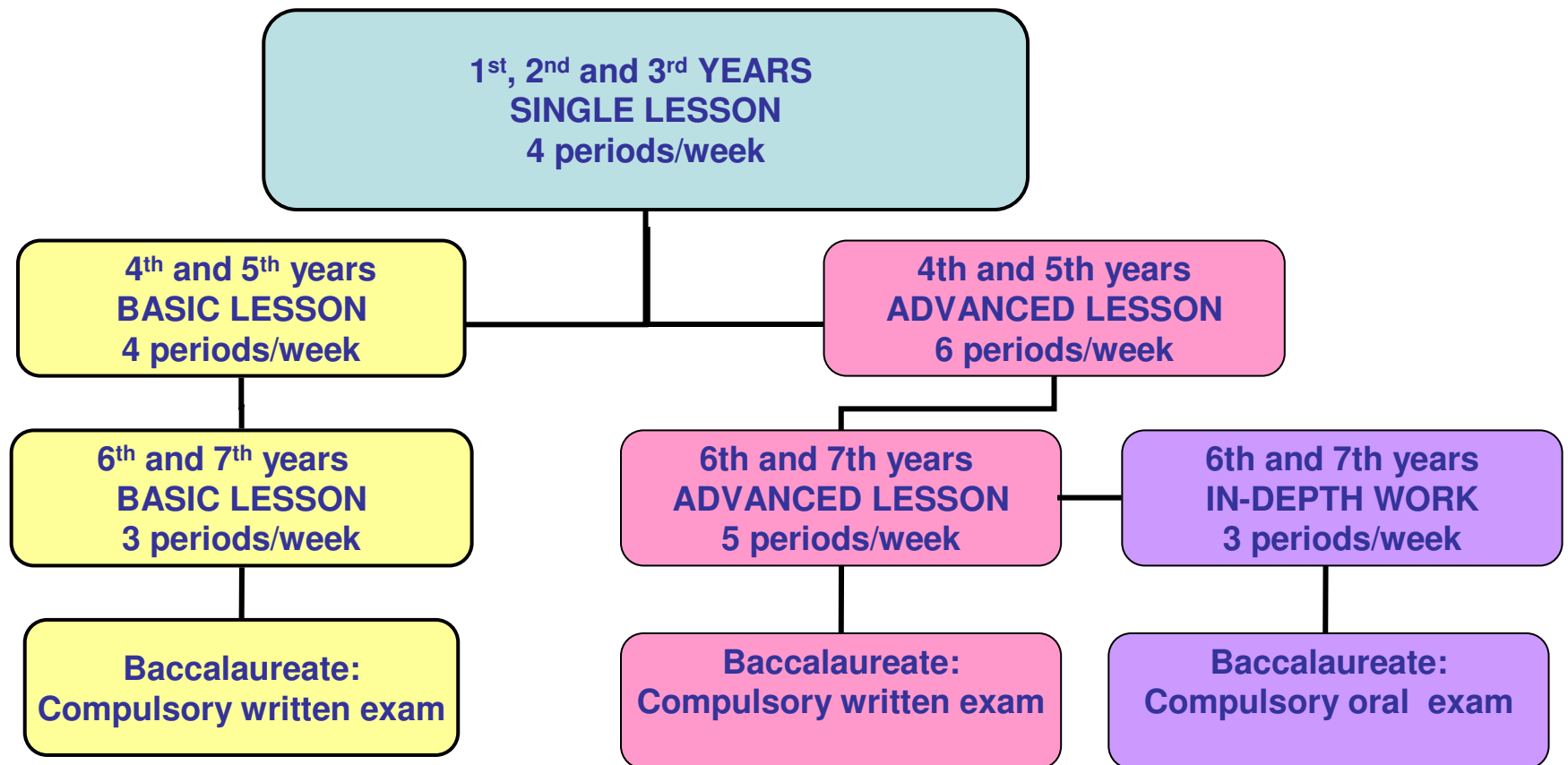
- **Co-ordination group.**
- **Mathematics in the secondary cycle of the ES.**
- **In principle decisions.**
- **Specifications.**
- **Choice of calculator.**
- **Form of the new programmes.**
- **Concrete construction example.**
- **Roadmap.**
- **Problems to solve.**



## COORDINATION GROUP

- **The co-ordination group consists of two national inspectors and mathematics coordinators from the 14 ES.**
- **It is chaired by the national senior inspectors:**
  - **Mr. Pierre Brzakala, Belgium.**
  - **Mr. Teijo Koljonen, Finland.**
- **The secretariat and coordination is provided by:**
  - **Mr. Wolfgang Frühauf, Luxembourg.**
- **The group's mandate is to review all of the mathematics programme for the ES secondary, to identify new teaching methods and to reshape the assessment methods in mathematics.**

# MATHEMATICS IN THE SECONDARY CYCLE OF THE ES





## IN PRINCIPLE DECISIONS

- **No formal calculators in the first 3 years of the secondary cycle.**
- **Formal calculators introduced for all levels of mathematics teaching in the last 4 years of the secondary ES cycle.**
- **All of the ES, all of the pupils and all of the teachers must use the same formal calculator model.**
- **All of the assessments by obligation contain two parts:**
  - **one subject to be answered without a formal calculator,**
  - **one subject specifically designed for the formal calculator.**
- **The compulsory examinations with the formal calculator will only become applicable after a two year transition period.**
- **A permanent structure for continuing education of teachers must be introduced.**



# **SPECIFICATIONS**

- **The formal calculator must be compatible with software enabling computer work.**
- **File exchange between pupils, between teachers and between teachers and pupils is essential.**
- **The formal calculator must be both a tool for both the pupil and for the teacher's work.**
- **The methods of use of the calculator and software must be available in all of the official languages of the EU.**
- **For the 4 year study cycle the pupil will keep the same calculator and any update in this period must be free of charge and uploadable.**
- **An expert group will revise the specifications every year for a new 4 year cycle.**



## CHOICE OF CALCULATOR

- **Consistent with the specifications and after a comparative study of formal calculators available on the market at present, the co-ordination group took the majority decision to adopt the TI-Nspire as the reference formal calculator to construct the new programmes.**
- **Until the new programmes are constructed definitively any pilot experiment conducted in the ES must be performed using the TI-Nspire in order to provide contributions which are compatible with the work of the co-ordination group.**
- **Before electing finally for this choice the co-ordination group has organised 3 initiation training courses for the use of TI-Nspire:**
  - **a training course for members of the co-ordination group,**
  - **two training posts bringing together almost a hundred mathematics teachers from all of the ES.**
- **The final choice of model of formal calculator will depend on approval from the higher ES bodies and the result of the compulsory European tender depending on the status of the ES.**



## FORM OF THE NEW PROGRAMMES

- **The new programmes will be presented in 3 columns:**
  - **Subject.**
  - **Knowledge and skills which the pupil must have.**
  - **Methodological advice: use of the formal calculator.**
- **The programmes will define the nature or subjects to be examined and not the competencies to be acquired at the different levels of mathematics teaching in the ES.**
- **Each programme must be preceded by an introduction stating the general competencies to be reached, the permitted or required technical tools and the assessment methods to be introduced.**

# CONCRETE CONSTRUCTION EXAMPLE

SUBJECT	KNOWLEDGE AND SKILLS PUPILS MUST BE BLE TO	
<p>Tangents (3 periods)</p>	<p>Draw by hand a tangent to curve at a given point.</p> <p>Calculate a sequence of gradients of chords, and understand that the limit of this is the gradient of the tangent to the curve.</p> <p>Understand the significance of the tangent as a measure of the rate of change.</p>	<p>CalcAct04 Tangent Line (TI Activity Exchange)</p> <p>CalcAct1 Derivative Trace (TI Activity Exchange)</p> <p>If the teacher wishes it, the derivative function can be defined in terms of</p> $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ <p>but no extensive, formal treatment of limits should be done.</p>



## ROADMAP

- **2008: New programmes become applicable for the first 3 classes of the ES secondary cycles (without formal calculators)**
- **2009: Finalising the new programmes for all class 4 and 5 levels of the secondary cycle.**
- **2010: Finalising the new programmes for all class 6 and 7 levels of the secondary cycle.**
- **2012: First European Baccalaureate with calculators.**



## **PROBLEMS TO SOLVE**

- **Establishing the training structure for teachers:**
  - **secondment for maximum time of 9 years.**
  - **recruitment in 25 EU countries.**
- **Establishing a multi-lingual data bank containing:**
  - **teaching units appropriate for the ES programmes,**
  - **model examinations for the different teaching levels,**
  - **European baccalaureates with the formal calculator.**
- **Organisation of procurement of calculators and restrictions from European tender rules.**
- **Change in application regulation for the European baccalaureate in order to ensure the diploma is recognised by all countries.**
- **Appropriate equipment for all classrooms and class sizes.**



**Thank you for listening.**

**Extensive detailed information about the ES and their operation is available in French, English and German on the official ES website:**

**<http://www.eursc.org>**