APEC Seminar on Computational Thinking Curriculum for the Digital Economy

A Framework of Statistical Thinking in the era of Big Data for the DIGITAL ECONOMY

Marcela Santillán

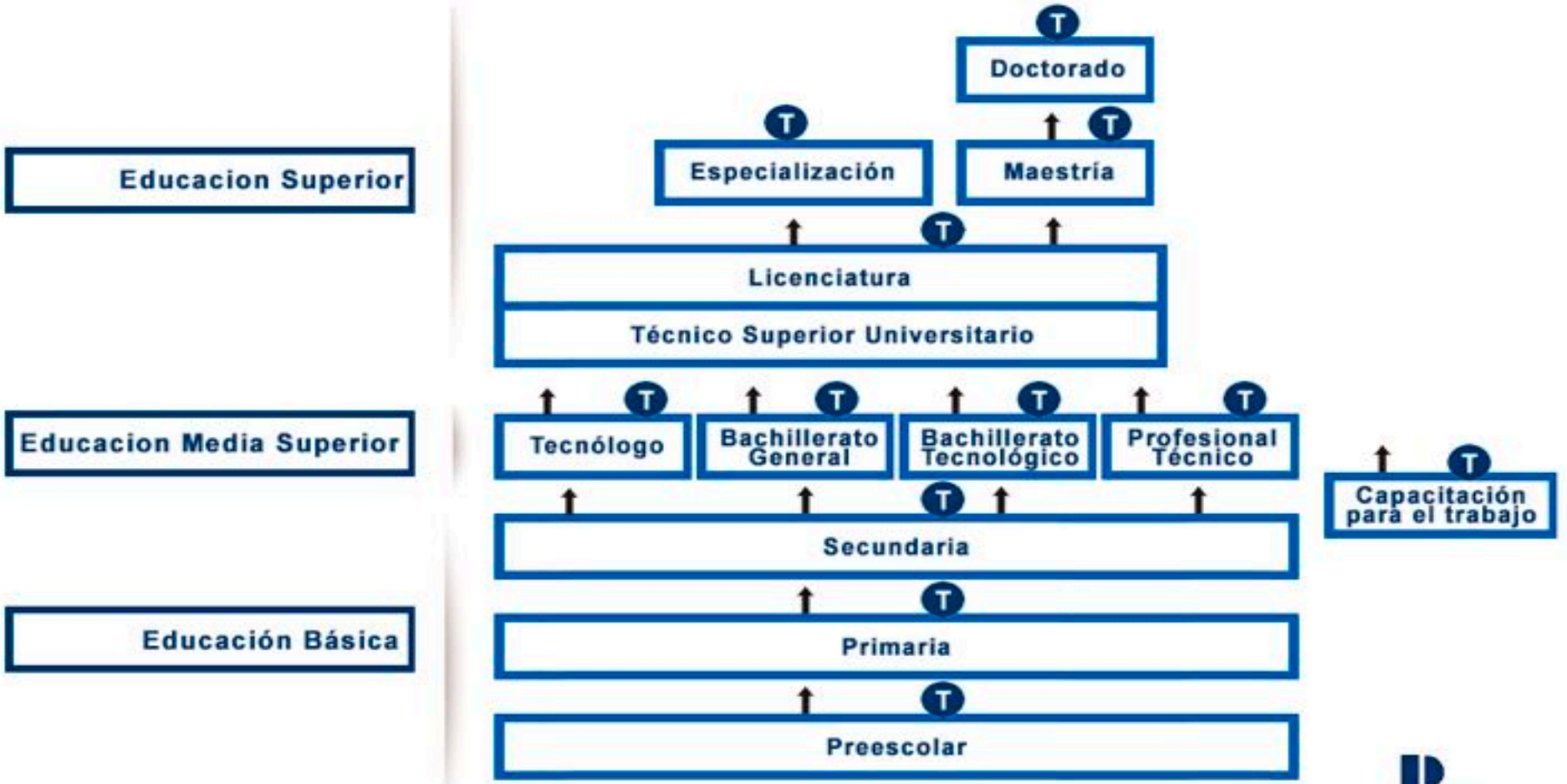
Mexico, May 2019

Task 0. Mexico's Sector of Education

General Scheme of the Mexican Education System

Basic Education Ages 3 – 15 years	Preschool (3 yrs.) Primary (6 yrs.) Lower Secondary Education (3 yrs.)
Upper Secondary Education Ages 16 – 18 years	Pre-college program (3 yrs.) or Professional Technician Ed. (3 yrs.)
Upper Education (career oriented tertiary ed.) Ages 19 to 29 years	Technical degree Bachelor degree Graduate programs

ESQUEMA DEL SISTEMA EDUCATIVO NACIONAL



UNIVERSIDAD PEDAGOGICA NACIONAL

* No se considera la educación especial ni para adultos mayores

Task 1. Statistics and topics related to databases curriculum

- Reviewing the syllabi of all current (2018) mathematics courses of the DGB (Upper Secondary Education Department) (https://www.dgb.sep.gob.mx/) we found that the courses of Probability and Statistics are of the conventional type mentioned in the discussion APEC document; that is, "focus on handling systematically-collected data, gathered for a purpose using planned processes."

- These courses are within the propaedeutical component and, according to our experience with teachers, not taken in most Upper Secondary Education schools.

Task 1 (cont.)

The first appearance of Statistics and Probability in the curricula is in upper secondary education, in the fifth and sixth semesters of pre-college.

- The first course covers descriptive statistics up to measures and dispersión of central tendency, including variables correllation. (https://www.dgb.sep.gob.mx/informacion-academica/programas-de-estudio/CFP/5to-Semestre/Probabilidad-y-Estadistica-I.pdf). The course does not cover any topics of Probability in spite of its name.

- The second course covers Set Theory and basic Combinatorics. It focuses on Probability and covers some distributions and Conditional Probability. It does not cover any topic of Statistics. (https://www.dgb.sep.gob.mx/informacion-academica/programas-de-estudio/CFP/6to-Semestre/Probabilidad-y-Estadistica-II.pdf).

Task 1. (cont.)

- The Information and Comunication Technologies (ICT's) program that is part of the Job Training Component, covers topics related to databases and their use. This program is only offered in technical Upper Secondary Education schools with some specialty related to ICT's.

- The specific topics covered in Module III: Systems Developments are in:
  - Submodule 1 Information systems, and
  - Submodule 2 Programming

Task 1. (cont.)

- Submodule 1 is dedicated to studying databases, presented as tables, as well as relations and queries. As to skills and learnings acquired, students are expected be able to use different models of databases. However, no specific bibliography is offered for these topics.

- Submodulo 2 covers basic programming concepts, such as algorithms, flowcharts, and types of languages; later focusing on the use of higher level languages, that are more user-friendly but less flexible than lower level languages.

Task 1. (cont.)

- In the case of the *Colegio de Bachilleres*, a subsystem of upper secondary pre-college education, the syllabi of the Job Training Component offer more specific bibliography on database management, as well as computer logic and programming. The syllabi may be consulted in:
  Matrices de componentes de formación para el trabajo COBAO
  http://www.cobao.edu.mx/index.php/docentes/componente-de-formacion-para-el-trabajo

Task 1. (cont.)

- In the case of *Bachilleratos Tecnológicos*, another subsystem of upper secondary pre-college education, the syllabus of the course *Tecnologías de la información y la comunicación* (Information and Communication Technologies), neither databases nor other related topics are covered, however, an attempt to prepare students for a responsible use of current digital tools, such as Internet searches, screening information according to source reliability; collaborative work on shared Google documents; downloading and using free software; and management of personal data. The syllabus may be consulted in:

  Tecnologías de la información y la comunicación
  http://www.cbtis179.edu.mx/portal/alumnos/descargas/tic_acuerdo%20653_2013.pdf

In principle, these educational skills and knowledge are desirable for any person that uses ICT's nowadays.

Task 1. (cont.)

- In the syllabi of the technical career program *Programación,* of the aforementioned subsystem *Bachilleratos Tecnológicos, in* modules I and II (first and second semester), sudents are expected to work with databases:
  - Módulo I: Develop and install application software, using structured programming, with persistent data storage.
    Submodulo 1 – Design and manage simple databases.
  - Módulo II: Develop application software using object oriented programming with persistent data storage.
    Submodule 2 - Design and manage advanced databases.

The syllabus may be consulted in:

Programación:

http://www.cbtis179.edu.mx/portal/alumnos/descargas/carrera_programacion_abr_2013.pdf

Task 2. Statistical Thinking

- In none of the documents consulted, did we find any reference to statistical thinking. Moreover, in the courses on Statistics and Probability, information management is considered as a means to develop stochastic, not statistical, thinking.
- Reviewing the blocks of the first course of Probability and Statistics, we found elements of what could be called statistical thinking: organize, summarize, and transmit information; estimate behaviours for conscious and informed decision making; generalize behaviours; identify skewings on populations; examine the behavior of two variables for decisión making, (https://www.dgb.sep.gob.mx/informacion-academica/programas-de-estudio/CFP/5to-Semestre/Probabilidad-y-Estadistica-I.pdf).

Task 3. Teaching materials used to teach statistical thinking

No specific texts were found. The reccomended bibliography is the traditional one.