InMside II project

Marcela Santillán

México

Statistics for middle school curriculum.

Statistics is called Information Management in primary and middle school curricula.

Topics focused on central trend measures, probability, as well as the analysis and interpretation of information presented in charts and tables.

The National and international assessments have shown very low results of Mexican children at 9th grade in these topics.

Results of National Examinations on Middle School

Leveles	Information magement	Results
Level I (383-529)	They interpret the possibility of occurrence of the events of an experiment from a frequency plot. However, they have difficulty establishing central trend measures when the data are not listed or to calculate probabilities.	10 out of 10
Level II (530-630)	Determine the value of the missing data of a set to adjust its arithmetic mean to a preset value. Calculate the probability of a simple event.	5 out of 10
Level III (631-728)	They interpret and abstract information that is presented in graphs. Calculate the probability of composite events. They compare and interpret the probabilities associated with events in a random experience.	2 out of 10
Level IV (729-866)	They determine the median of a dataset, for an even number of data. They solve arithmetic mean problems when data is presented on bar charts.	1 out of 10

A dos escuelas secundarias se les aplicó una encuesta al inicio del año escolar, para saber la cantidad de libros que habían leído durante el año anterior. Los datos fueron organizados en una gráfica de polígono de frecuencias.

Libros leídos en los últimos 12 meses
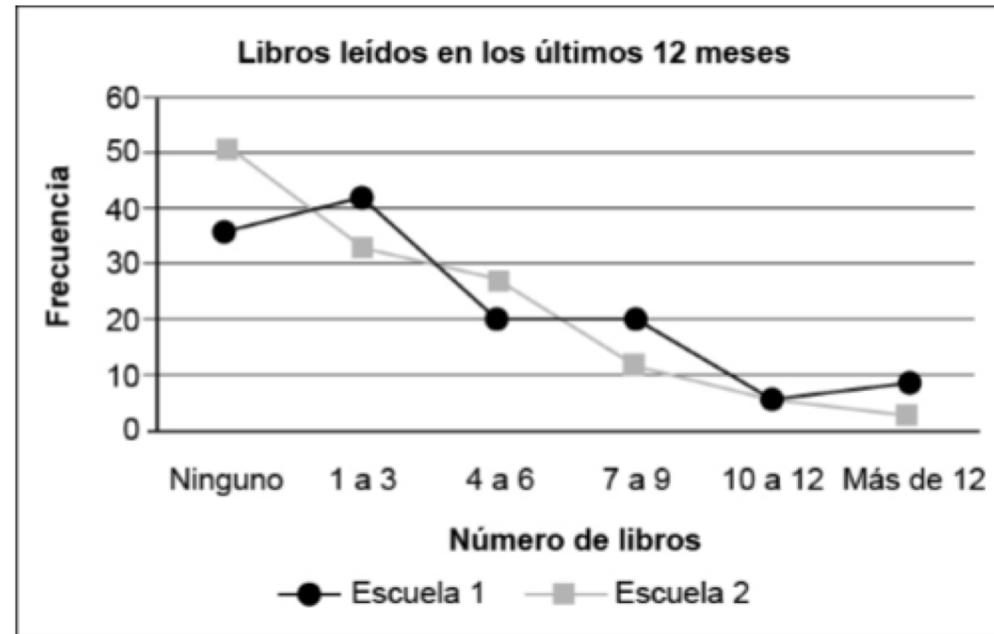
Considerando los datos de las dos escuelas, ¿cuántos alumnos leyeron de 4 a 6 libros en total?

A)   20

B)   28

C)   51

D)   48

What is going on in México

The ministry of education is working in a new curriculum for basic education that will be implemented for 2022.

We just started working with 30 middle school teachers with the lesson study approach.

We will be using Gapminder Tools, animated global statistics that everyone can understand: https://www.gapmimder.org/tools/#$chart-type=bubbles

Computational thinking

Problems:

Low access to computers in middle schools.

Almost no connectivity.

In 2011 middle school curriculum incorporated a programme called "Digital Skills for All" it only worked for three years.

We have neither coding, nor artificial intelligence, in the upper high school curriculum.

Computational thinking

The 3 proposed pillars of computational thinking are not parallel, but in a hierarchy:

- traditional computational thinking, mathematical thinking and abstract (outside the computer) mathematical modelling skills (applying maths to model scientific phenomena)

- mathematical modelling through computer coding

- machine learning (a particular, and fairly abstract mode or paradigm of mathematical modelling through computers, consisting of a mindset or perspective and a bag of tricks)

General Proposal

The bases then, which have to be taught first, for eventually reaching the top of the hierarchy, are:

- traditional coding
    - variables
    - control structures
    - data structures
    - control Flow
    - …
- mathematical thinking
- practising mathematical modelling through code

General Proposal (2)

We intend to teach all these preliminary skills thus:

- use of the python command line

  - first as a kind of scientific calculator

  - then applying the skill learned to coding solutions of mathematical problems

  - then coding simple mathematical models of natural phenomena

General Proposal (3)

It is possible, given appropriate software to provide a taste of the power of machine learning:

- with software that hides much of the complexity, while providing enough control to experiment;
  - but, while this provides motivation to further experiment with these techniques,
  - and perhaps some exposure to the basic concepts,
  - any deeper learning and mastery of the techniques has to wait for the other underlying skills to be developed;
- it is nevertheless desirable to compile a list of software which fulfils this function, if there is any, as a resource for us and for the rest of this community.

Computational thinking

We start working with our middle school teachers in our new environment

http://educere.jerx.net

For the opportunity and your attention
Thank you very much!