

Statistics in Vietnamese curriculum: institutional intention and examples



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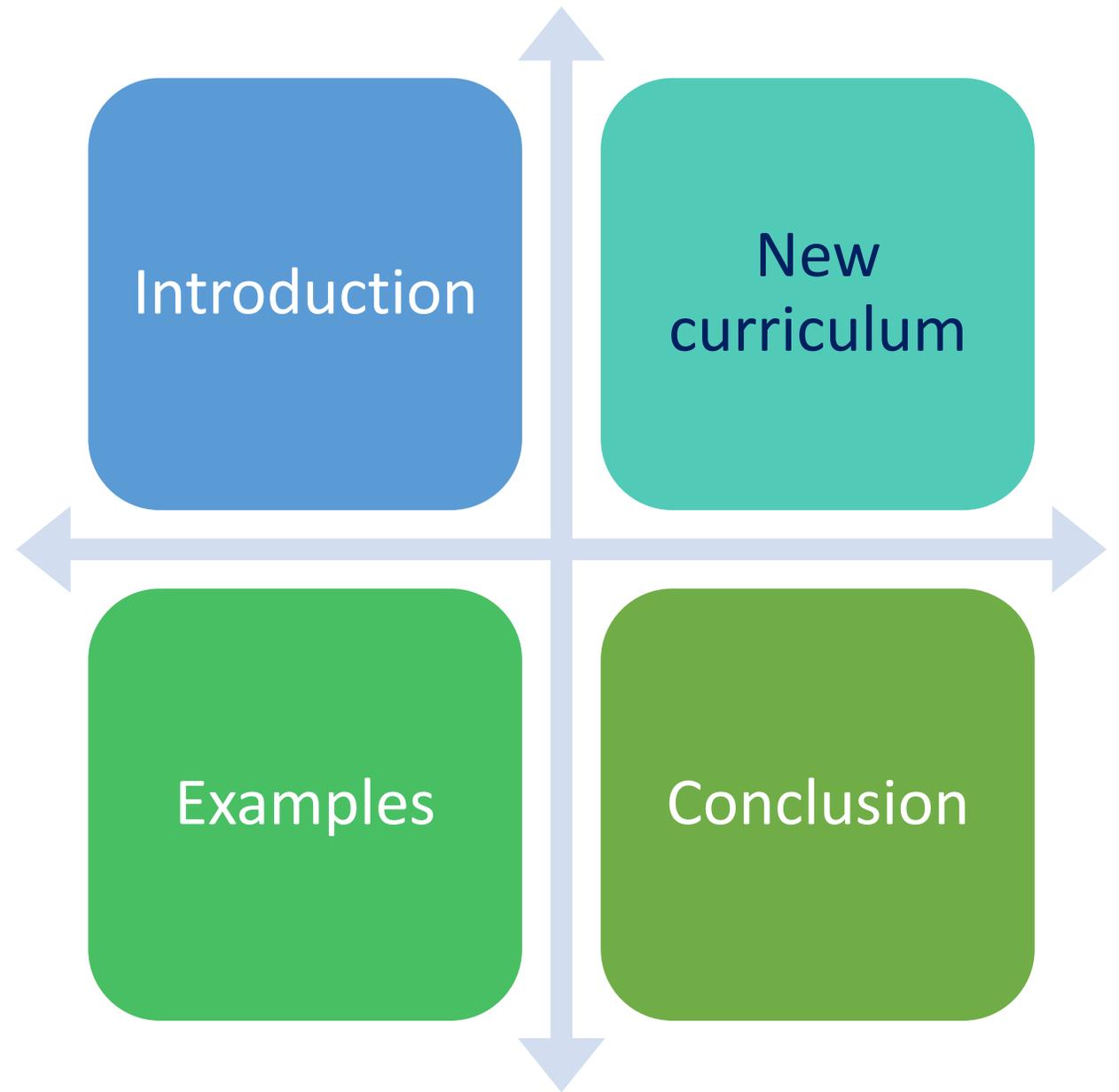


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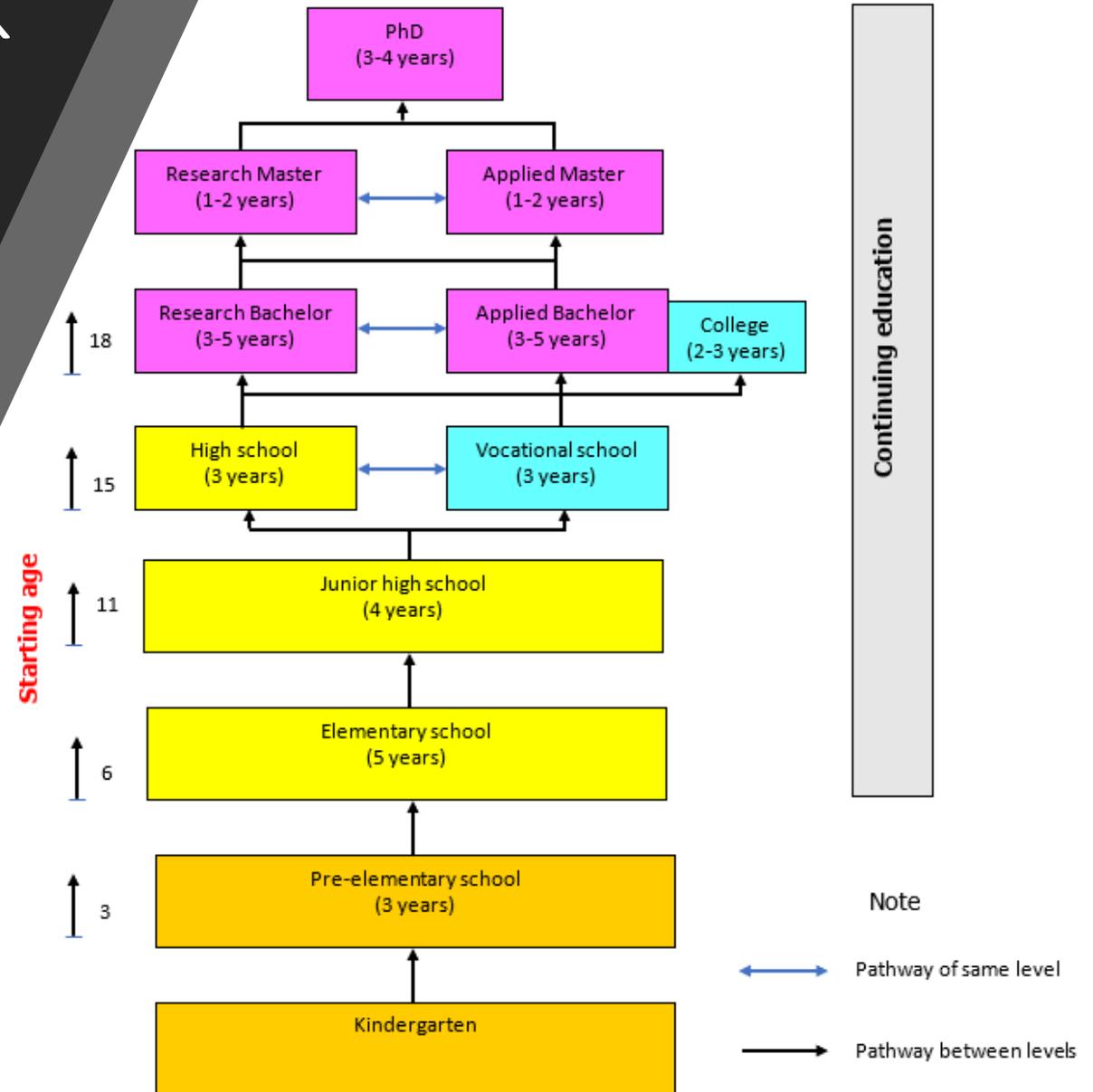
Presentation outline



Educational frame work in Vietnam (from 2016)

- On 18th October 2016 the Ministerial decision 1982/QĐ-TTg about the Vietnamese qualification framework has been issued. According to this, the qualification system has been divided into 8 level:

Level 1 - Elementary Level I; Level 2 - Elementary level II, Level 3 - Elementary level III, Level 4 - Intermediate level; Level 5 - College; Level 6 - University; Level 7 - Master; Level 8 - PhD.



Top 6 digital transformation trends in Education



DIGITAL ERA TRANSFORMATION



We are part of the 4th industrial revolution

Physical

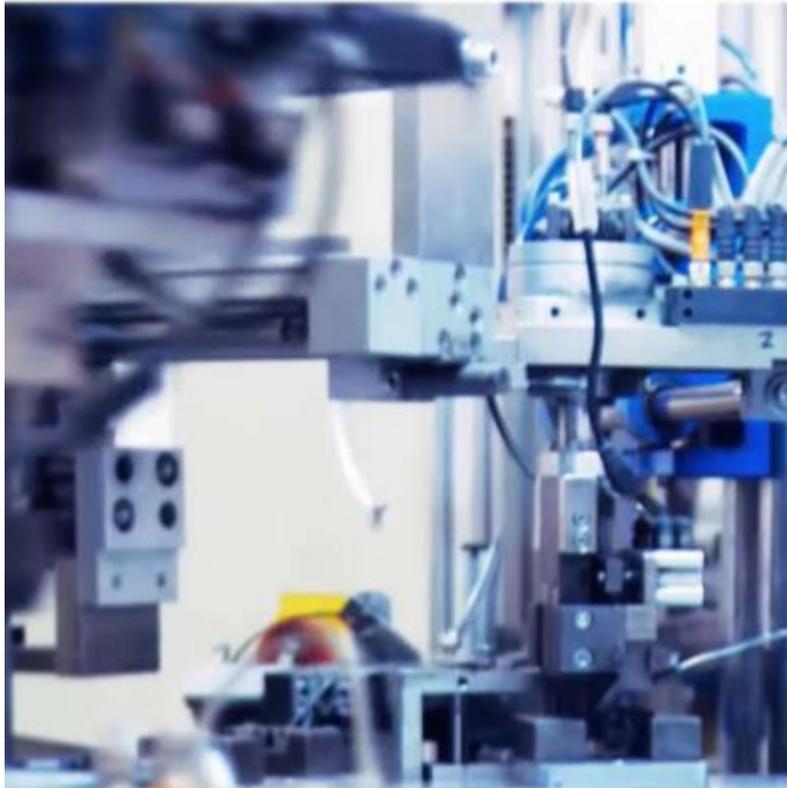
Autonomous vehicles, robotics,
3D printing, new materials

Biological

Genomic diagnostics,
treatment, engineering

Digital

IoT, Blockchain, AI, Big Data, VR/AR
Quantum computing

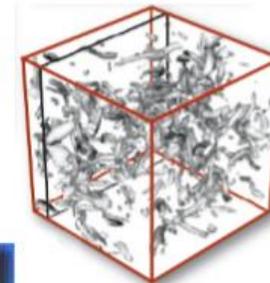


Science paradigms

- Thousand years ago:
science was **empirical**
Describing natural phenomena
- Last few hundred years:
theoretical branch
Using models, generalizations
- Last few decades:
a **computational** branch
Simulating complex phenomena
- Today: **Data exploration** (eScience)
Unify theory, experiment, and simulation
 - Data captured by instruments or generated by simulator
 - Processed by software
 - Information/knowledge stored in computer
 - Scientist analyzes databases/files using data management and statistics.



$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{4\pi G\rho}{3} - K\frac{c^2}{a^2}$$



London subway

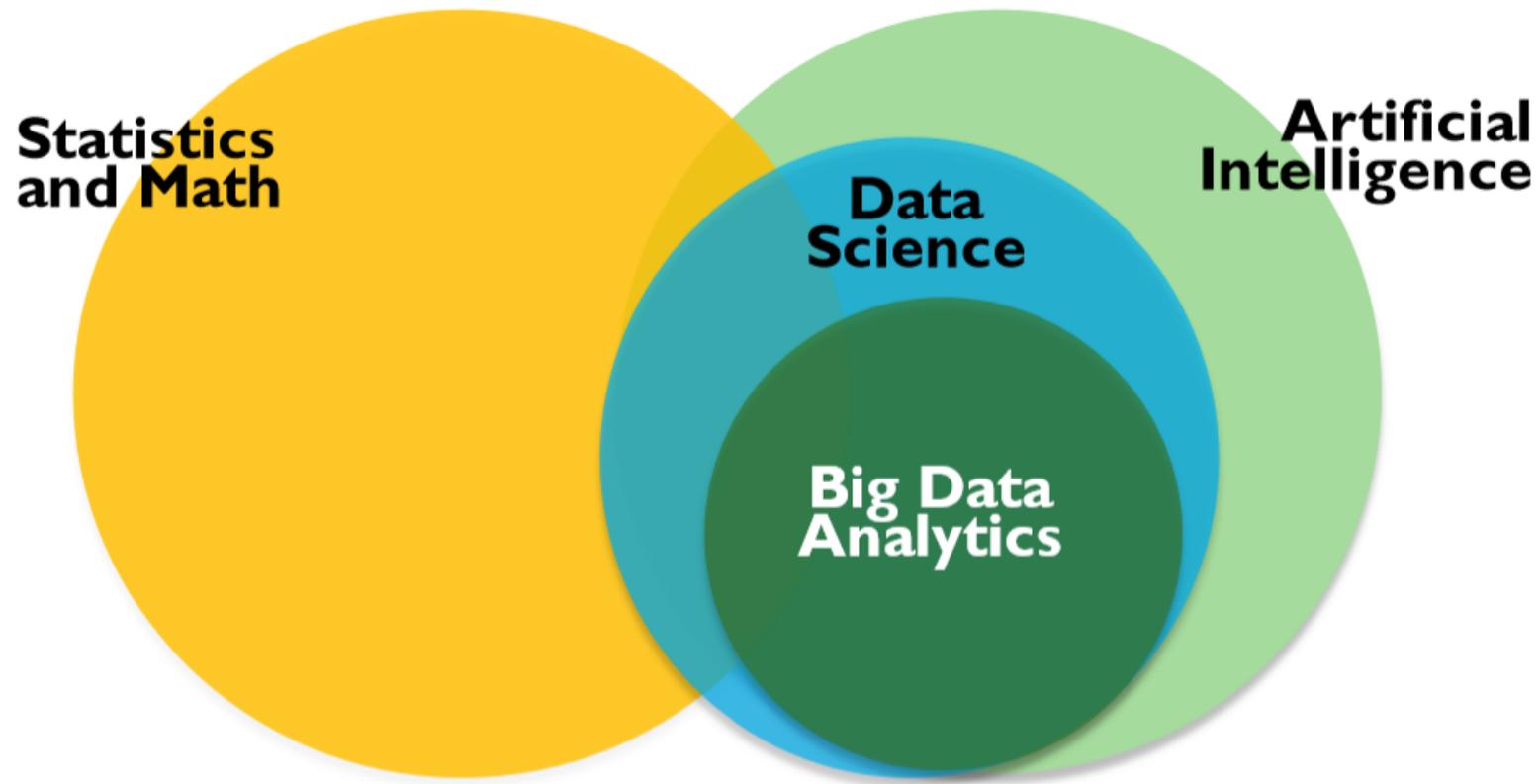
London taxi

Much more data than ever before (Ho T-B, 2019)



don't
s just
not
and

Mathematics, AI, Data Science and Big Data Analytics



Introduction: Educational reforms Vietnam since the 1945- the independent era

1946

1946 reform: Hoang Xuan Han curriculum

Since 1950

1950 reform: influenced by Russian curriculum

Since 1980

1980 reform: 1 program; 3 textbooks

Since 2003

2000 reform: 1 program; 1 textbooks **Actual curriculum**

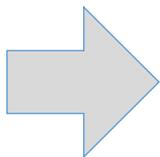
Since 2015

2018 reform: 1 program; several textbooks

STATISTIC AND PROBABILITY

- In current program ?

	Middle School				High school		
Grade	6 th	7 th	8 th	9 th	10 th	11 th	12 th
Actual program	X	Statistic	X	X	Statistic	Combinatoric Probability	X



- **Discontinuity** in teaching of statistics
- **Separation** between statistics and probability
- **Absence** of Stat and Probas in final examinations and entrance examinations to the University

STATISTIC

... only descriptive !

Middle School : grade 7th	High school : grade 10th
<ul style="list-style-type: none">- Frequency – Table of Frequencies-Diagram in segments/Bar chart-Mean-Mode	<ul style="list-style-type: none">-Diagram in contiguous columns of equal width (histogram)-Mean-Mode
	<ul style="list-style-type: none">- Percent – Table of percents- Grouping in equal classes- Polygonal curve of frequencies/percents- Median- Variance and Standard Deviation

STATISTIC

... only descriptive !

Middle School : grade 7 th	High school : grade 10 th
<ul style="list-style-type: none">- Frequency – Table of Frequencies- Diagram segments/Bar chart-Mean-Mode	<ul style="list-style-type: none">-Diagram in contiguous columns of equal width (histogram)-Mean-Mode
<p>Passing from discrete data to continuous data</p> <ul style="list-style-type: none">/percents- Median- Variance and Standard Deviation	

STATISTIC

some elements of institutional analysis

4 MAJOR TYPES OF TASK :

T1: Summarize data table (with or without grouping)

T2: Represent data in graphic

T3: Calculate numerical summaries (from data table)

T3.1: C

- Grouping in class is never taken care of by student

T3.2

T3.3

T3.4

- Adjacent classes/ discontinues same width

T4: Compare two

STATISTIC

some elements of institutional analysis

4 MAJOR TYPES OF TASKS :

T1: Summarize data table (with or without grouping)

T2: Represent data in graphic

T3: Calculate numerical summaries (from data table)

T3:

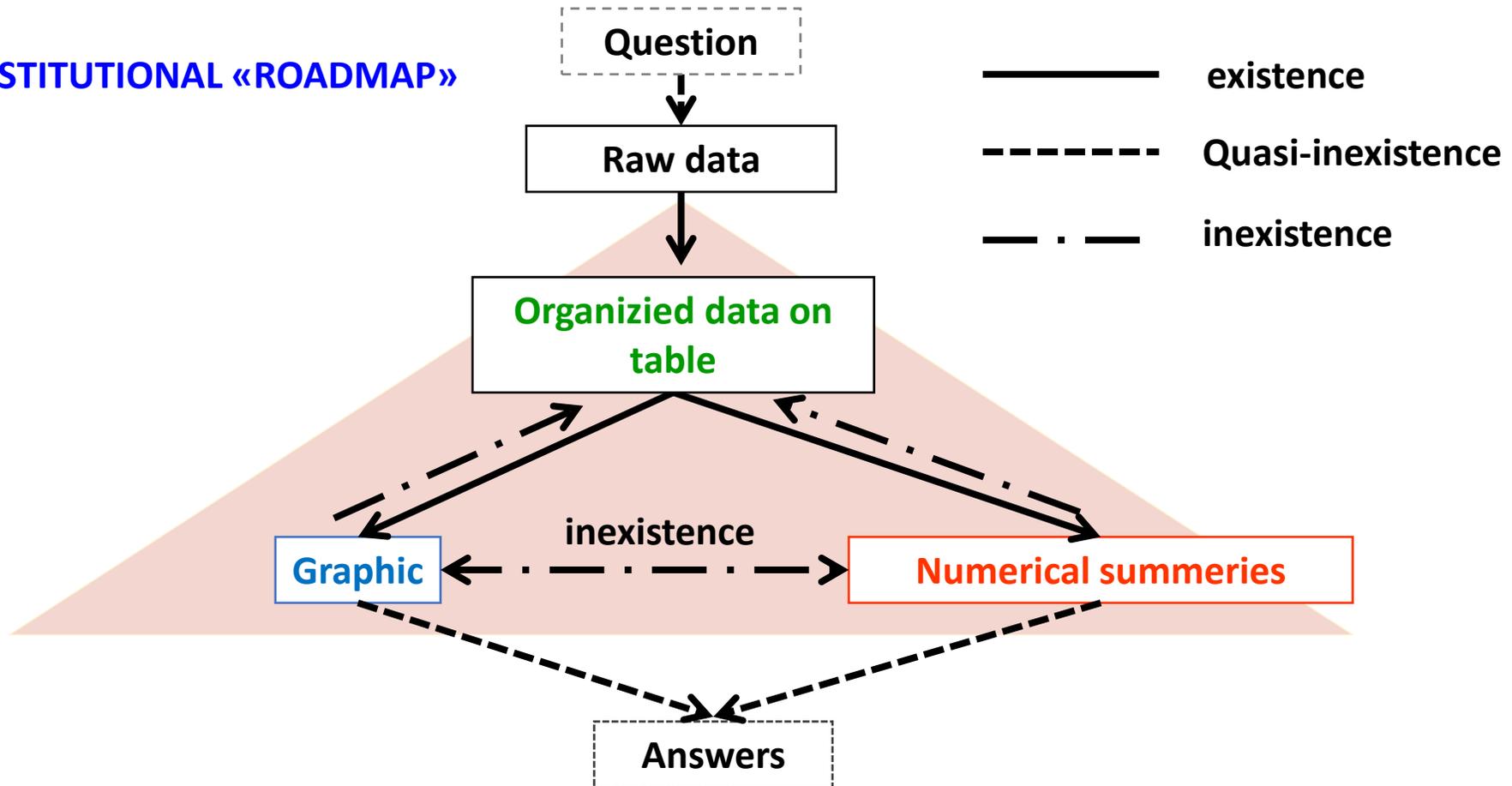
- Absence of cumulative frequency/percent
- Absence of notion of area in "histogram"

T4: Compute

STATISTIC

some elements of institutional analysis

INSTITUTIONAL «ROADMAP»



STATISTIC

some elements of institutional analysis

4 MAJOR TYPES OF TASKS :

T1: Summarize data table (with or without grouping)

T2: Represent data in graphic

T3: Calculate **numerical summaries** (from data table)

T3.1: Calculate the mean

T3.2: Calculate the median

T3.3: Calculate the mod

T3.4: Calculate the standard deviation

T4: Compare two empirical statistical distributions

Mean, median :

- the arithmetic mean
- task T3.1
- algebraic-formulas technic

position (mean, mode, median)

- is considered as the best representation of the data (shared meaning)
- competition between the **mean, median** and it's organized and contracted by algorithm.

Introduction: 2018 education reform

- Comprehensive and radical educational reform
- New curriculum
- Schedule

Grade 1: 2019-2020; Grade 6: 2020-2021; Grade 10: 2021-2022 and so on

The new curriculum is expected to develop the skills of students and bring out their creative sides; to have more out-of-school and creative experience, rather than only theory.

The new curriculum will include compulsory practical activities for pupils to experience. Activities for primary schools will focus on developing their life skills, soft skills, relationships with friends, teachers and family.

Meanwhile, secondary education will focus on activities for social and community services and job-oriented activities.

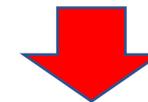
In the new informatic curriculum: 12/2018

- Computer Thinking: The process of identifying computational aspects in the world around us, thereby helping to solve the problem, such as knowing how to divide the problem into manageable parts and to give algorithms to solve them. Computer thinking is a basic and necessary skill for everyone, not just for computer scientists. Computer thinking is a cognitive and logical reasoning process to solve the problem, which is the ability to:
 - + Decomposition of work and data.
 - + The generalization, identification and usage of patterns.
 - + Abstraction, choice of representation.
 - + Conditions for evaluation and estimation.
 - + Algorithm.

Computer thinking not only allows students to access computer topics but more importantly, it develops students' thinking skills to solve problems in learning and life.

Statistics in the new curriculum (12/2018)

Statistics and Probabilities



Mạch kiến thức Cấp học/Lớp		Số, Đại số và Một số yếu tố giải tích	Hình học và Đo lường	Thống kê và Xác suất	Hoạt động thực hành và trải nghiệm
Elementary school	1	80%	15%	0%	5%
	2	75%	17%	3%	5%
	3	70%	22%	3%	5%
	4	75%	16%	4%	5%
	5	50%	40%	5%	5%
	Toàn cấp	69%	23%	3%	5%
Junior high school	6	49%	30%	14%	7%
	7	43%	36%	14%	7%
	8	43%	36%	14%	7%
	9	43%	36%	14%	7%
	Toàn cấp	43%	36%	14%	7%
Senior high school	10	44%	35%	14%	7%
	11	44%	35%	14%	7%
	12	44%	35%	14%	7%
	Toàn cấp	44%	35%	14%	7%
Toàn bộ chương trình		44%	35%	14%	7%

STATISTIC

→ research questions

Question. Can we improve the statistical significance for the relationship between graphical and numerical summaries ?

→ **Scenario**

STATISTIC

→ research questions

→ Scenario

Institutional meaning : arithmetic mean.

Objective: → a new meaning:

"the mean is the abscissa of gravity center of histogram which represents the data."

Type of Task-Technical favored: look for the abscissa of the gravity center of the histogram by calculations in the physics.

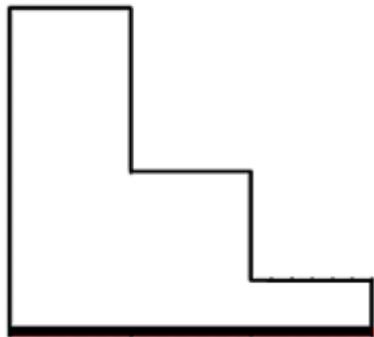
Institutional conditions: is based on the knowledge of physics in grade 10th.

Scenario : Mean

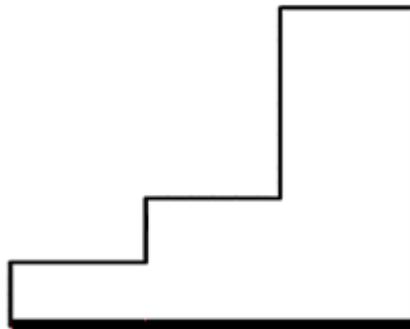
We propose the task "*seek the abscissa of the gravity center of the bar chart*" to favor a computational technique from the field of physics.

Phase 1: Students are divided into 6 groups. There are 3 types of groups. Each type receives the relevant files

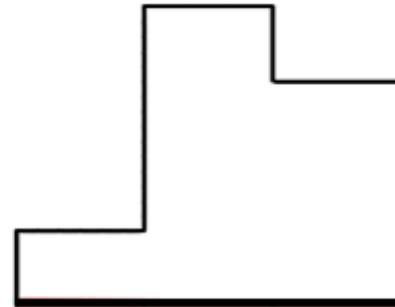
1. Find the equilibrium position on the colored side of a red card.



Type 1



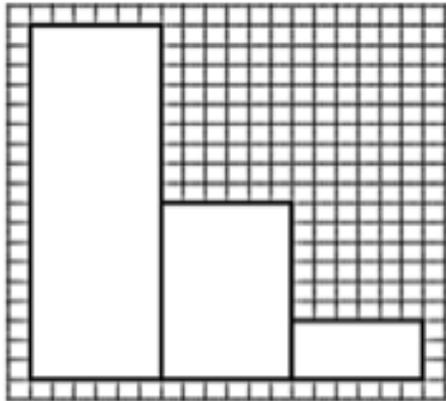
Type 2



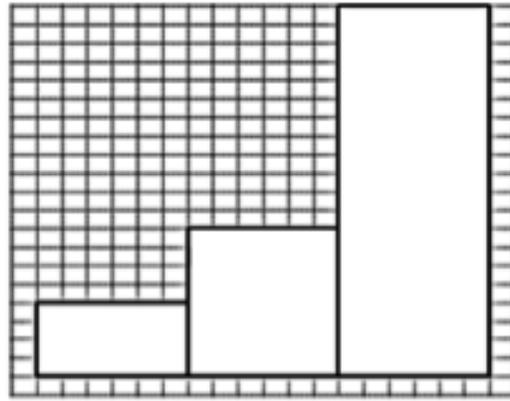
Type 3

Scenario : Mean

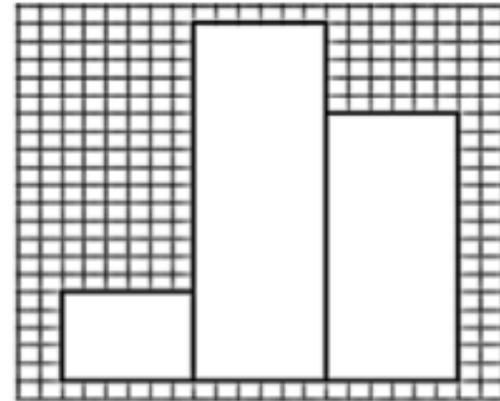
2. Prove your answer on the grid sheet.



Type 1



Type 2



Type 3

Scenario : Mean

Phase 2: Calculate the mean for a given histogram of a statistical data.

Phase 3: Observe the shape of cardboard in phase 2 and form of histogram, then compare the abscissa of the gravity center of the carton and the mean found (end of phase 2).

Phase 4: Teacher institutionalizes new meaning for the mean by a justification of equality between the mean and the abscissa of the gravity center of the cardboard.

Scenario : Mean

chia các khối theo tỉ lệ ra.
Gọi F_1 là trọng lực của khối m .
 F_2 là trọng lực của khối $2m$.
 F_3 là trọng lực của khối $5m$. $5m$

F_1

F_{12}

F_2

F_3

A'

$$\frac{F_1}{F_2} = \frac{d_1}{d_2} = \frac{m}{2m} = \frac{1}{2}.$$
$$\frac{F_{12}}{F_3} = \frac{d_{12}}{d_{13}} = \frac{3m}{5m} = \frac{3}{5}.$$

Vậy vị trí cân bằng tại A' .