



Online Workshops for Lesson Study 2.0:  
Artificial Intelligence (AI) and Data Science for Education in APEC Economies

# The challenge of developing students' statistical reasoning in times of Data Science: Chilean experiences in Early Statistics

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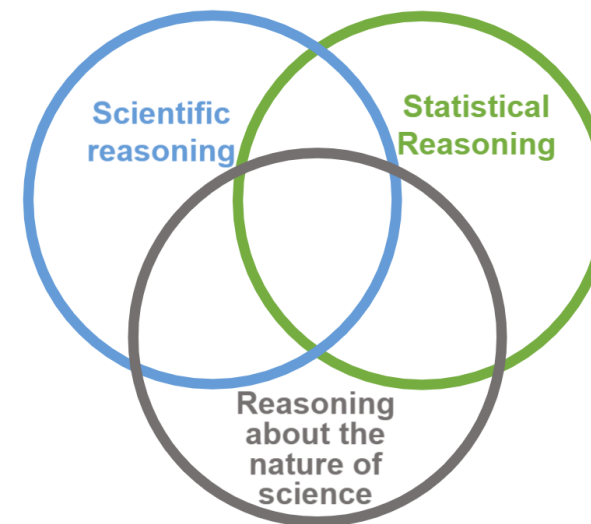
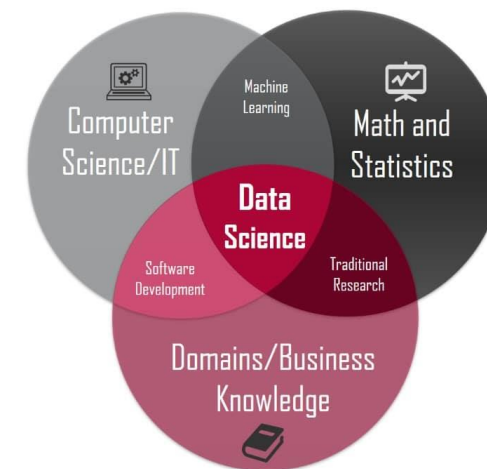


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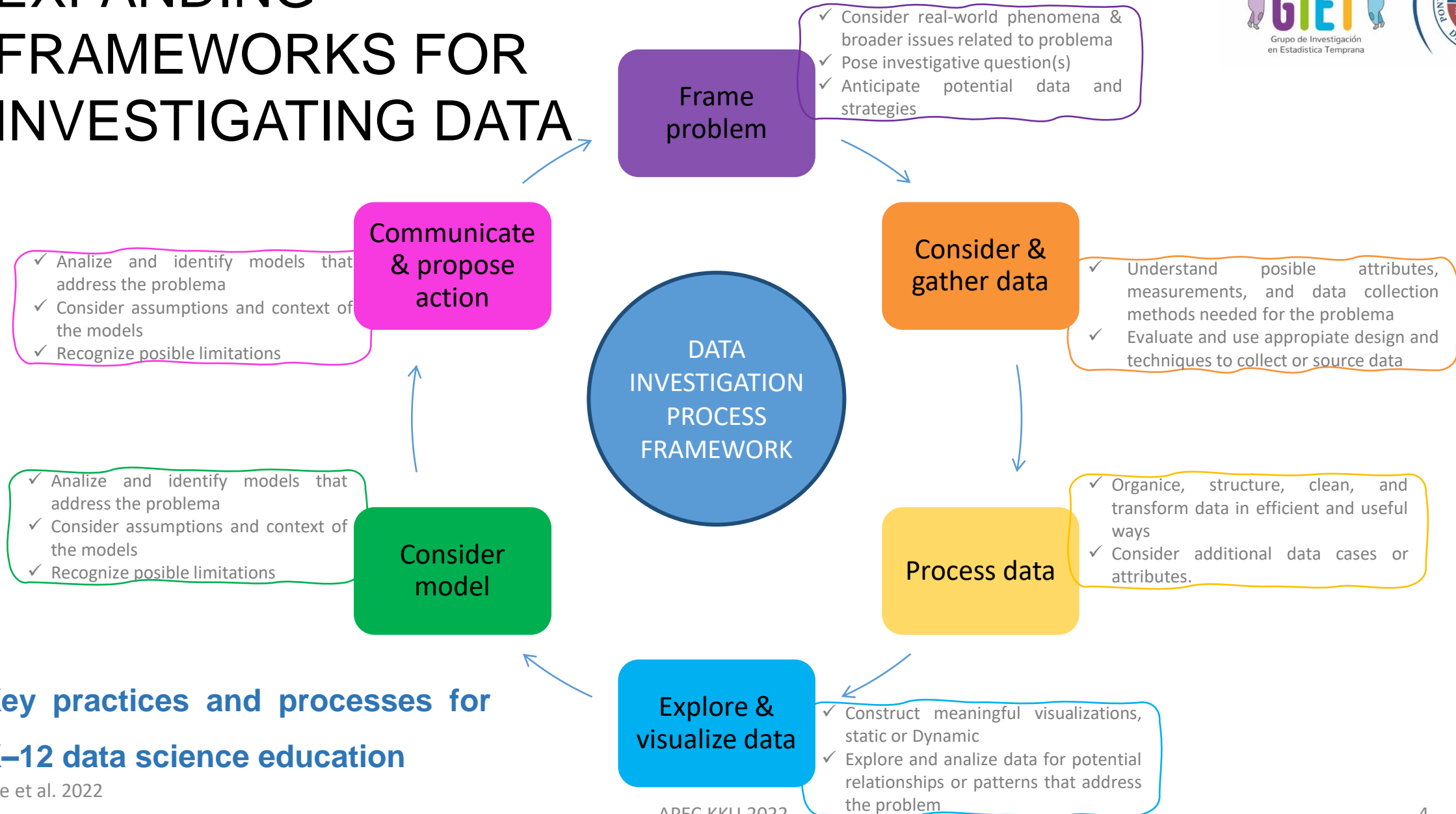


# Teaching and learning data science

- With the proliferation of big data in many areas such as industry or social sciences, competent reasoning about data has become even more critical (Biehler et al., 2018).
- From the perspective of statistics education, data science requires students to gain "new skills" and reinforce informal inferential reasoning by building inferences based on data analysis.



# EXPANDING FRAMEWORKS FOR INVESTIGATING DATA



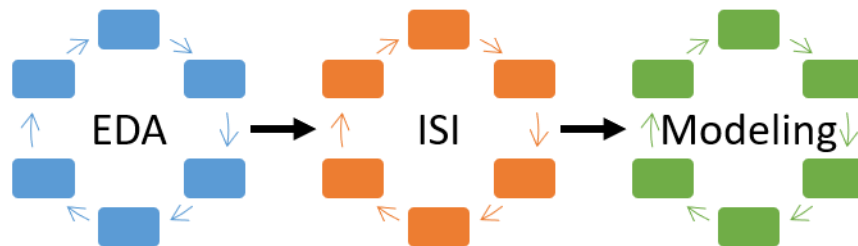
## Key practices and processes for K-12 data science education

Lee et al. 2022

# Educating students in data science

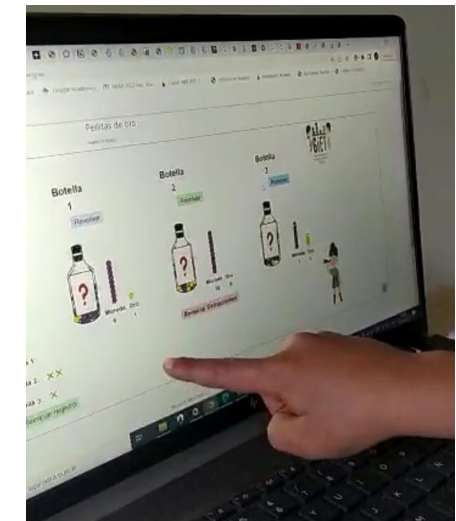
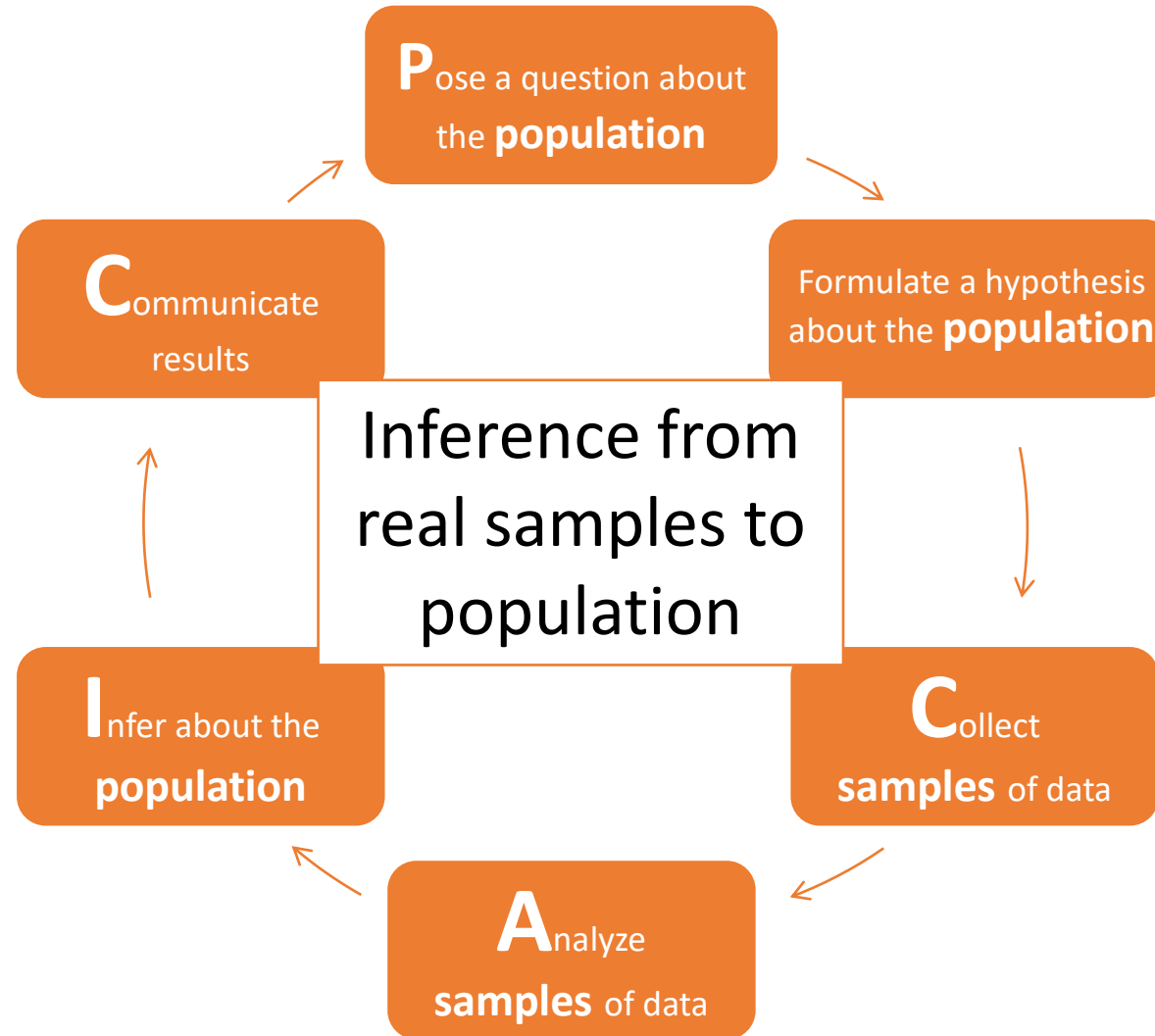
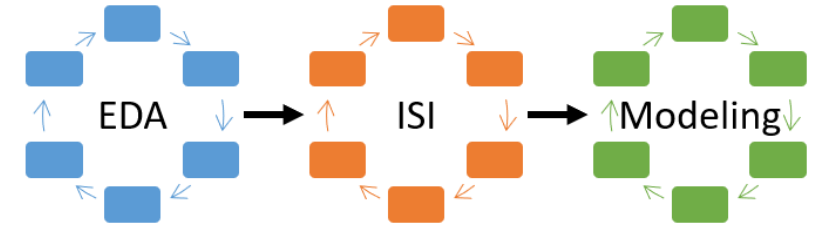
- ...goes beyond teaching about algorithms, skills of manipulating data sets, selecting and applying appropriate analyses, and creating and interpreting visual representations of data.

- It also involves raising a **critical understanding of how data are produced and how they can be used for particular purposes**, including the role of context in interpreting data. It emphasizes **developing an awareness for data ethics, and considering the implications for policy and society when powerful algorithms are used.**

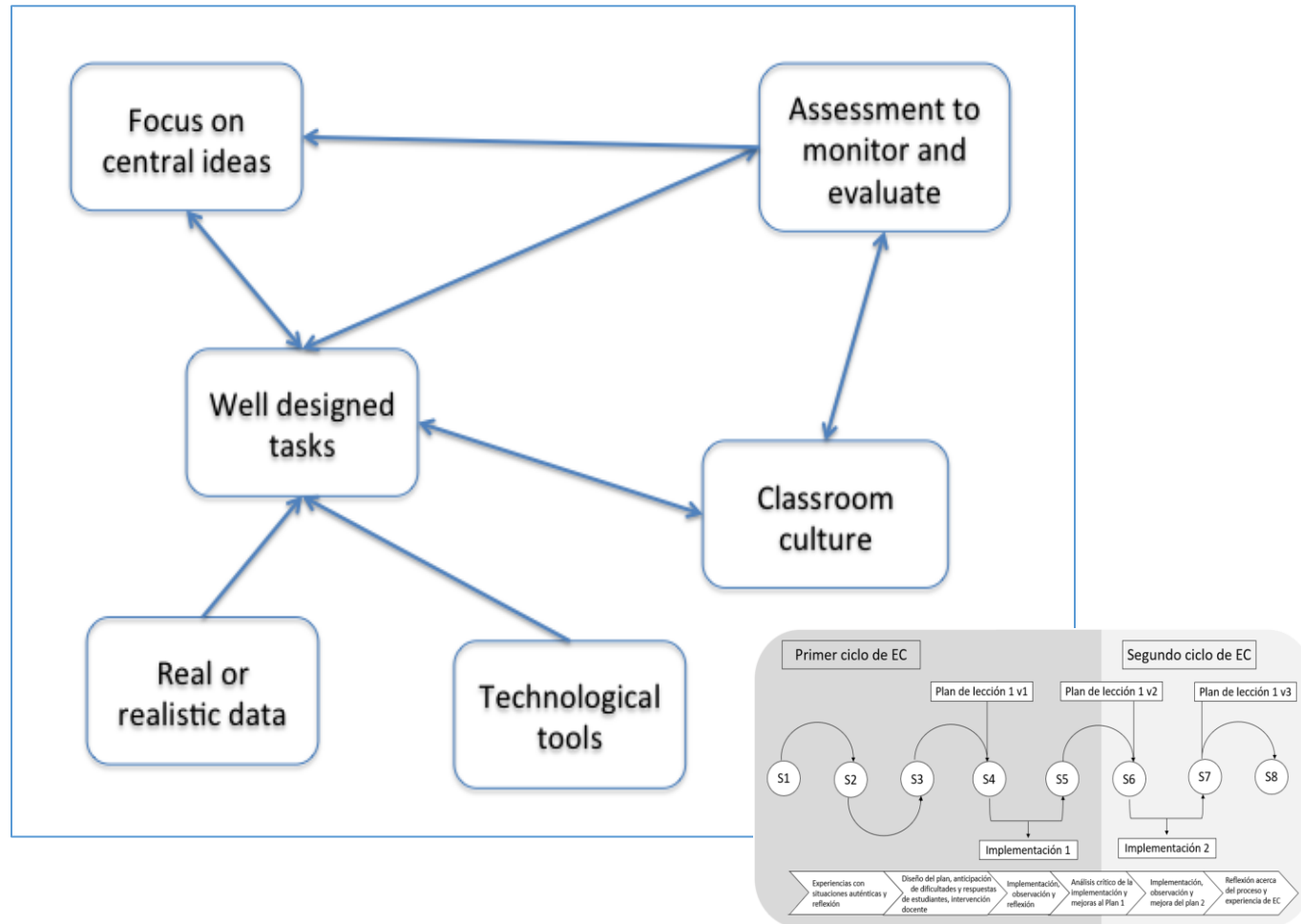


Biehler et al. 2022

# Informal Statistical Inference (ISI)



# Design Considerations for the Statistical Learning Environment for research into the teaching and learning of data science with Lesson Study



These dimensions provide a wide spectrum of factors or starting points, which must be considered and balanced in the design of learning environments in statistics education.

The goal of designing positive and effective statistics learning environments is for students to develop a deep and meaningful understanding of statistics and have the opportunity to develop their ability to think and reason statistically (as data scientist).



Network of six interrelated dimensions of a learning environment.

# How?: playful situations, stories and apps

## Games



We will play "the frog race" for this you will need 2 coins of \$10

The game is as follows:

- We will flip 2 coins at the same time.
- we will use boards like the one shown on the right side
- Each frog advances towards the goal like this:
  - advances 1 square if both are tails
  - advance 1 square if both are heads
  - advances 1 square if they are different
- The winning frog is the one that reaches the finish line first

Goal box  
→

Start →	 TAILS	 FACES	 DIFFERENT

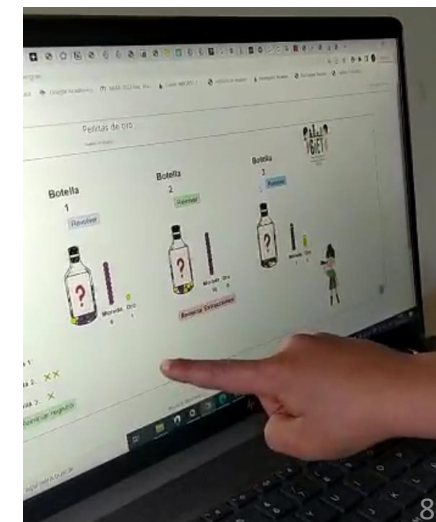
## Stories (with artefacts)



It is important to craft a data story to convey insight about the problem to the audience so they can make inferences and decisions.

APEC KCU 2022

## App





# Grades K-3: Learning trajectory for the development of the Informal Inference Reasoning



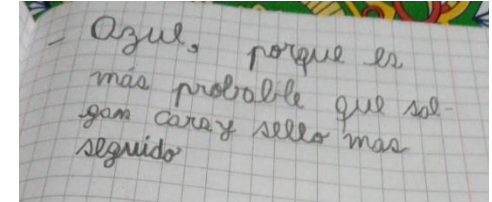
**Step 1.**  
Make a prediction that contrasts with the data obtained



**Step 2.**  
Visualize and recognize the variation in the samples

Marcar con un	✓	☹️	☹️	☹️	😊	😊
	Imposible	Poco probable	probable	Casi seguro	Seguro	
¿Qué tan probable es que gane 🍌?	✓	✓	✓✓	✓✓		
¿Qué tan probable es que gane 🍌?		✓✓✓✓	✓		✓	
¿Qué tan probable es que gane 🍌?			✓	✓✓	✓✓✓	

**Step 3.**  
Become aware of the regular behavior of the samples by assigning a confidence level to each event



**Step 4.**  
Generate statements beyond the available data using expressions of uncertainty

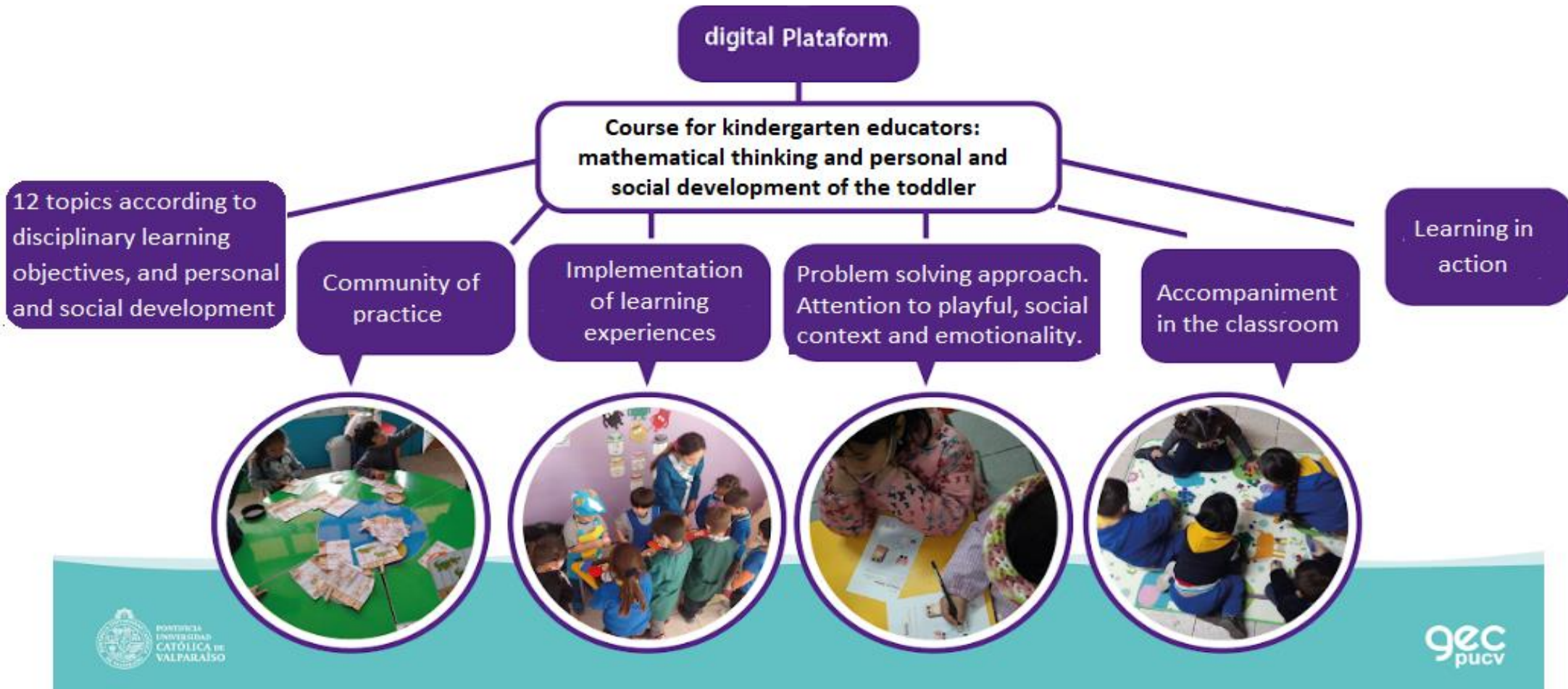


How can we harvest the full potential of integrated pedagogies that provides a next step forward in data science education?

In early age → Gradually with age → Formal learning



# The research and development (R & D) project: Preschool Teachers Scaffolding in Mathematics



# Resources for teaching and learning



Community  
of practice

Monitoring

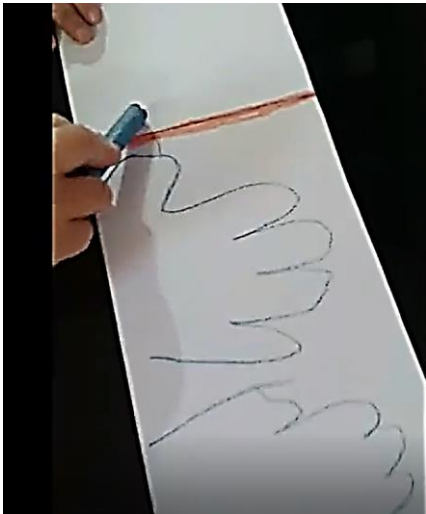
Digital Plataforma

# The last sequence of the 12 topics

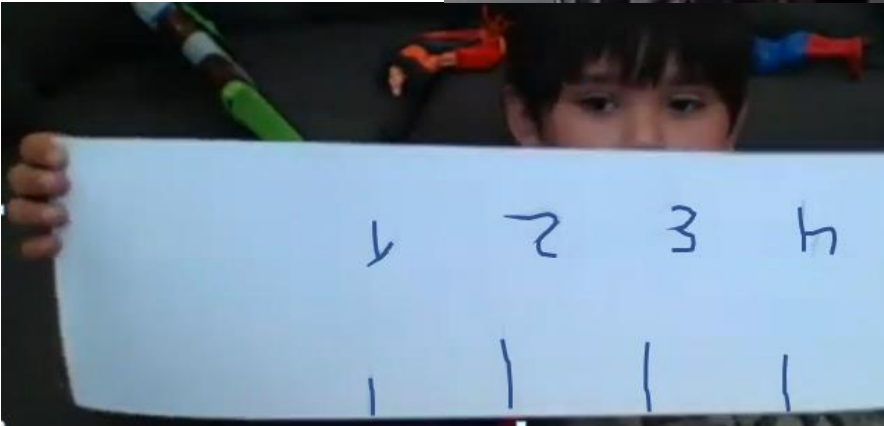
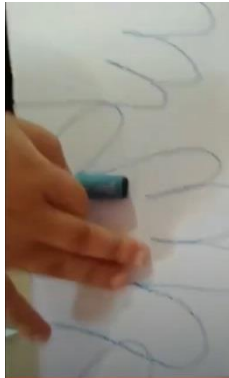
(built using Lesson Study)

## Measure

Is the door wide enough?



Pre-  
Kinder



Comparación Patrones Clasificación Espacio - Tiempo Seriación Orden Ordinales Numerales Cantidad Composición Agregar - Quitar **Medida**

## MEDIDA

FONDEF ID20i10070



Which worm is longest?



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## MEDICIÓN

### Experiencia 2

¿Cuál de los dos gusanitos es el más corto? Piensa tu respuesta.

El desafío para los párvulos es emplear comparaciones indirectas usando medidas no estandarizadas registrando datos.



Consultas generales

### ACTIVIDAD DE INICIO PARA LA EDUCADORA (NT1 Y NT2)

Actividad de inicio para la Educadora

### NIVEL TRANSICIÓN MENOR (NT1)

#### SECUENCIA DE ENSEÑANZA A IMPLEMENTAR EN EL AULA

Materiales Secuencia de Enseñanza NT1

- Planificación - Experiencia 1 (para imprimir)
- Planificación - Experiencia 2 (para imprimir)
- Planificación - Experiencia 3 (para imprimir)

#### VÍDEOS DE APOYO

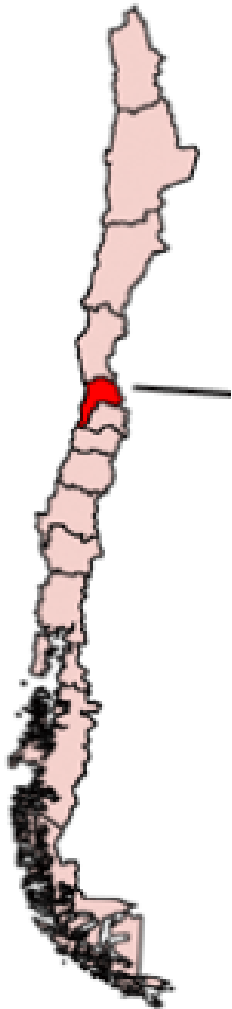
- Vídeo Resumen Experiencia 1
- Vídeo Resumen Experiencia 2
- Vídeo Resumen Experiencia 3

### NIVEL TRANSICIÓN MAYOR (NT2)

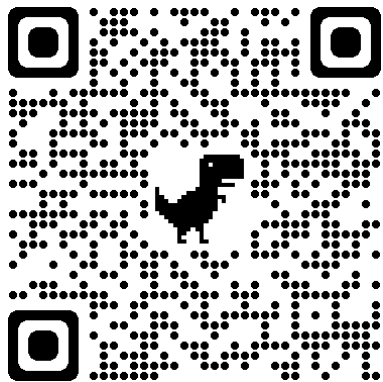
#### SECUENCIA DE ENSEÑANZA A IMPLEMENTAR EN EL AULA

Materiales Secuencia de Enseñanza NT2

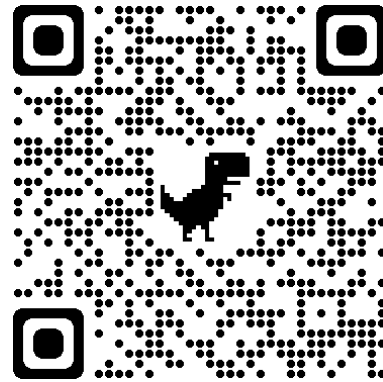
Kínder



**Imagining the future: Early statistics that inspire full citizenship in the s. 21st**  
 (GIET, 2021)



[estudiodeclases.cl](http://estudiodeclases.cl)



[estadisticatemprana.cl](http://estadisticatemprana.cl)

Thank you!

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