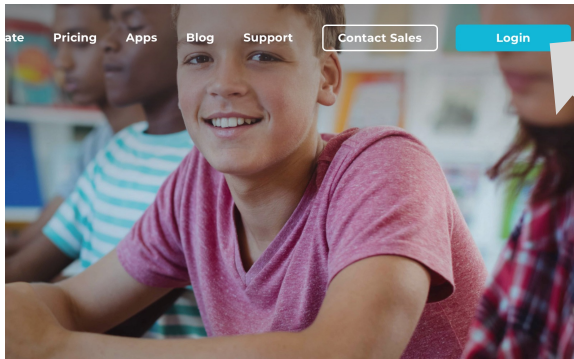


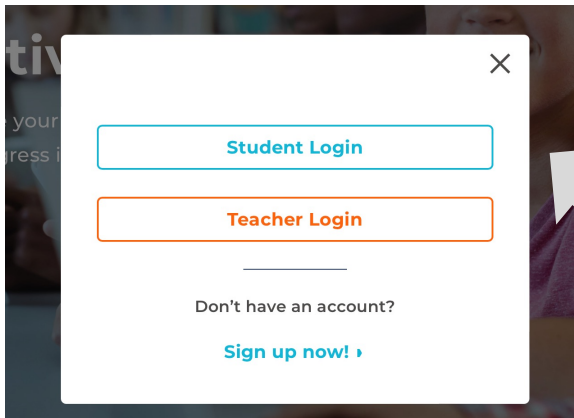
**Del aula a la institución:
repensando la práctica docente en Química**

Santiago Sandí-Ureña

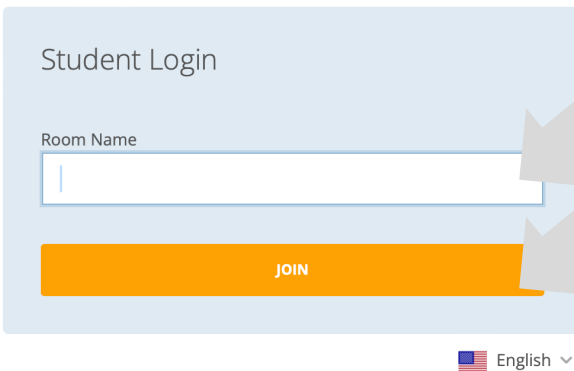


Ingresar a: www.socrative.com

Clicquear en “Login”



Clicquear en “Student Login”



Ingresar “UCLM2023”

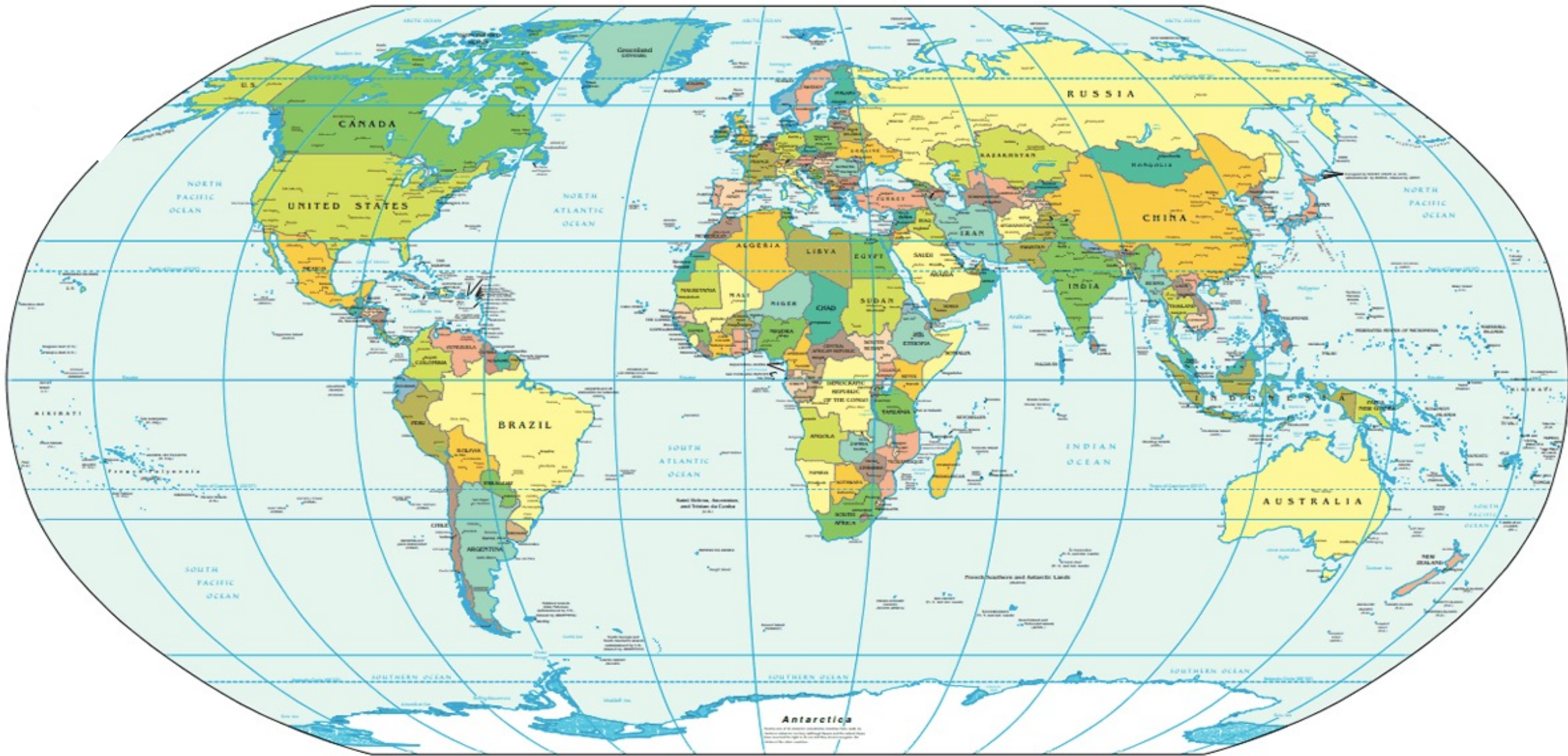
Clicquear “Join”

Tres ítems.

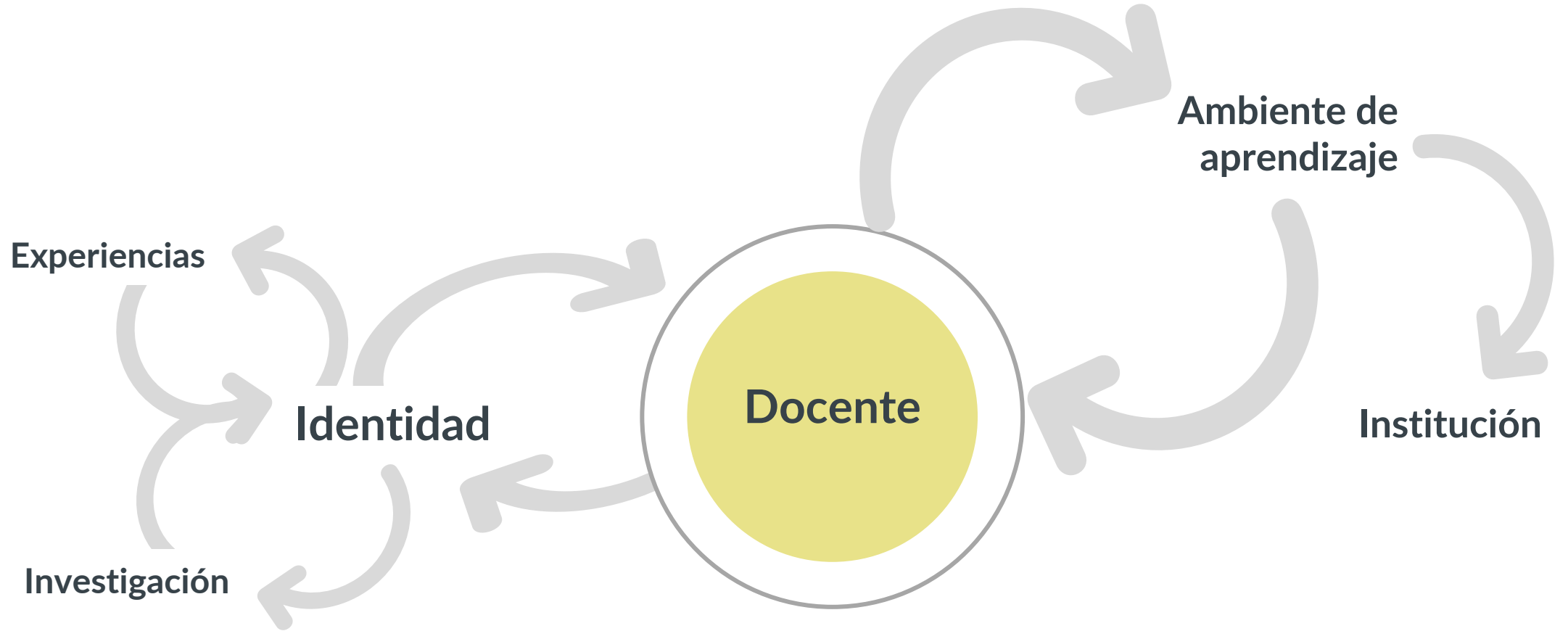
Respuestas son anónimas



You've completed the current activity.
Waiting for the next activity to begin...



Del aula a la institución: repensando la práctica docente en Química.



Actividad



Resuelva el siguiente problema de la mejor manera que pueda. Esta es una actividad individual. Puede utilizar calculadora, papel y lápiz. No utilice ningún otro recurso. Muestre sus cálculos y razonamiento.



“Un automóvil en Filadelfia sale hacia Nueva York a 70 km/h.

Quince minutos más tarde, un automóvil sale de Nueva York hacia Filadelfia—que está a 145 km de distancia—a 90 km/h.

¿Cuál automóvil está más cerca de Filadelfia cuando se encuentran?”



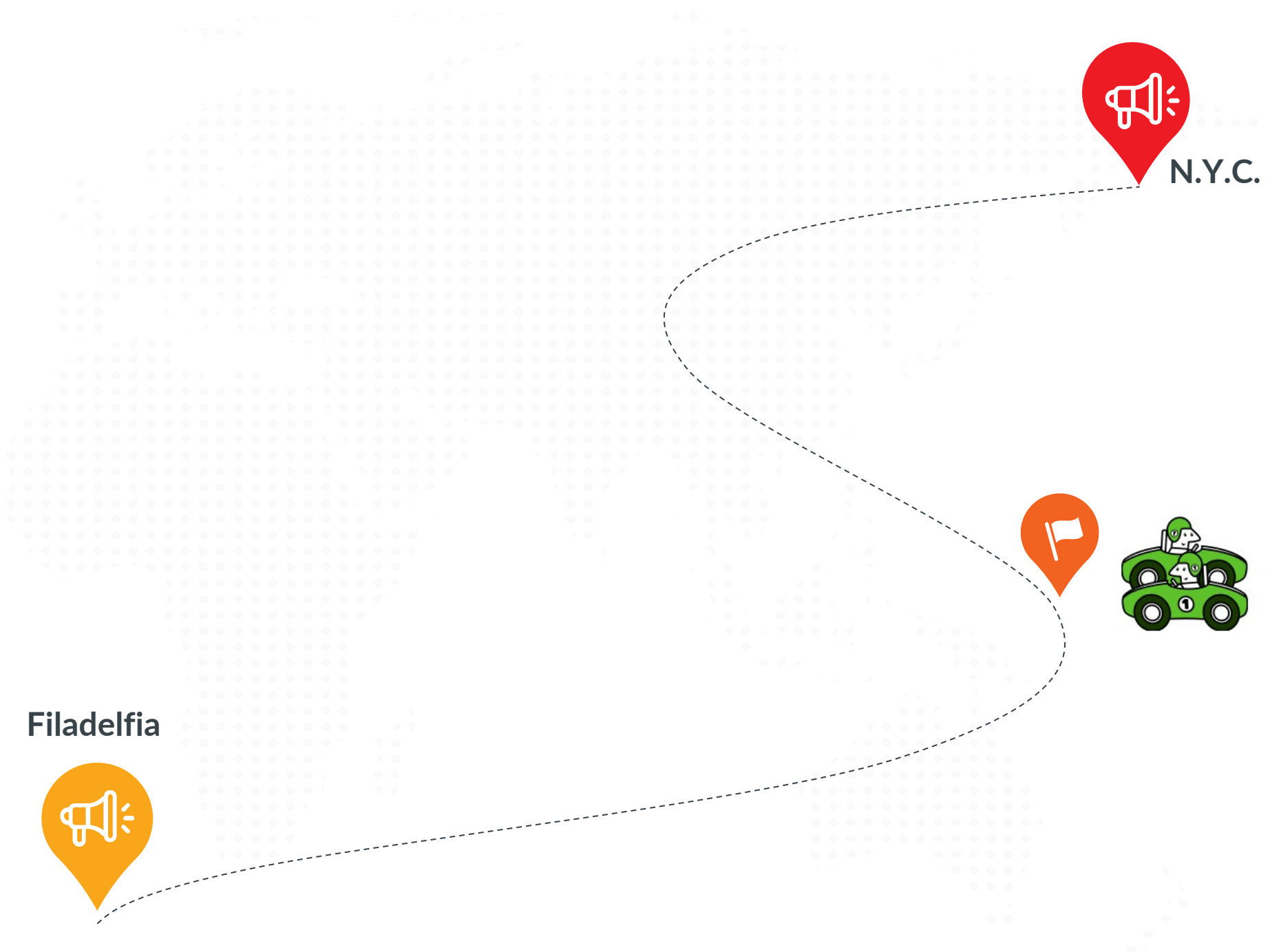
0 min
70 km/h
Filadelfia



145 km

N.Y.C.
90 km/h
15 min





N.Y.C.



Filadelfia



Part VI

FINAL PROBLEM

PLEASE WORK INDIVIDUALLY

Choose and solve **only one** of the following problems.

Problem #1 "A car in Philadelphia starts toward New York at 40 miles an hour. Fifteen minutes later a car in New York starts toward Philadelphia—90 miles away—at 55 miles an hour. Which car is nearest Philadelphia when they meet?"

Problem #2 "George wants to fry 3 eggs as quickly as possible. Unfortunately, his pan only holds two eggs and each egg takes 2 minutes a side to cook. What is the shortest amount of time in which George can fry his 3 eggs?" (Yes, George wants both sides of his eggs cooked!)

The car that starts in Philly P = 43.04

① P NY

T0 • •

46 mi

$\frac{3 \cdot 6 \cdot 5 \cdot 11}{23}$

T15 10 PC NC

40 mph 80 55 mph

$\frac{36 \cdot 55}{46} = \frac{3 \cdot 6 \cdot 5 \cdot 11}{2 \cdot 23}$

T30

$\frac{45 \text{ mi}}{40 \text{ mph}}$

$\frac{45 \text{ mi}}{55 \text{ mph}} + 15 \text{ min}$

$T = \frac{60 \cdot 55}{115}$

$45 \text{ mi} \times \frac{1 \text{ hr}}{40 \text{ mi}} \times \frac{60 \text{ min}}{1 \text{ hr}}$

$45 \text{ mi} \times \frac{55 \text{ mi}}{55 \text{ mph}}$

$20 \cdot 3 \cdot 55 = 115T$

$40 \cdot 3 \cdot 55 = 115 \cdot 2T$

$40 \cdot 9 \cdot 55 = 115 \cdot 6T$

$P = \frac{40}{40} \times 60 T$

$P = \frac{60 \cdot 60 \cdot 55}{40 \cdot 115} = \frac{360 \cdot 55}{4600} = \frac{36 \cdot 55}{46}$

$R = 60 (T - 15)$

55

$N = 90 - \frac{60 (T - 15)}{55}$

$55 \cdot 60 T = 40 \cdot 10 \cdot 55 - 60 \cdot 40 T \Rightarrow 40 \cdot 40 \cdot 55 = 55 \cdot 60 T \rightarrow 60 \cdot 40 T \Rightarrow 40 \cdot 40 \cdot 55 = 115 \cdot 60 T$



Solución de problemas

Metacognición

Aprendizaje experimental

Propósito de la educación

Reforma

Aprendizaje experimental

PROBLEMS IN THE EXPERIMENTAL PEDAGOGY OF CHEMISTRY.

ELLWOOD B. SPEAR,

Massachusetts Institute of Technology.

The justification for including a subject in the curriculum of the secondary schools is either that through the study of it the pupil shall acquire useful information, or that it is well adapted for developing him mentally. The multiplication table is learned because it is useful in after life; it is a time-saver. Geometry, on the contrary, is taught not because it is essential to the majority of high school graduates, but rather because it is said to afford an excellent means of mental training. Luckily, the study of most subjects not only imparts useful information, but at the same time tends in some degree at least to increase the mental capacity of the pupil. That chemistry belongs to this latter class will scarcely be doubted by anyone at all familiar with the subject. In addition to a large

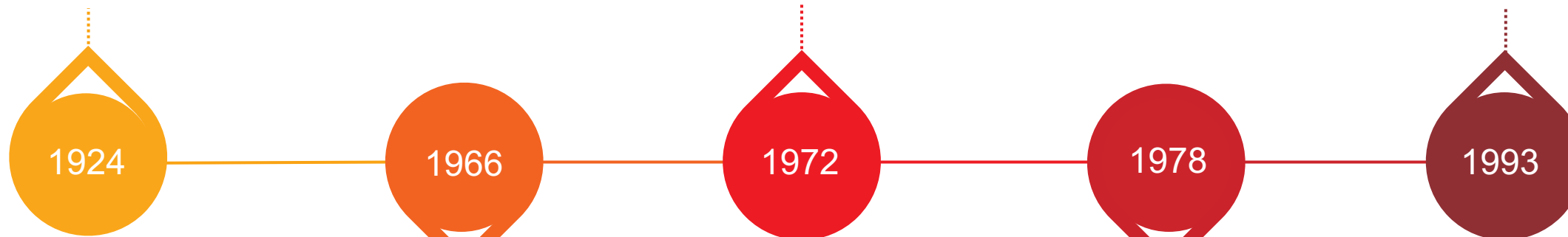
Spear, E. B. *Journal of Educational Psychology*, 1915, 6(4), 231-241.



What we teach our freshmen in chemistry

Jacob Cornog and J. C. Colbert

Mezcla de contenidos enciclopédicos y desconectados.



CBA: Aproximación del enlace químico.

CBA and CHEM Study: An appreciation.

J. S. Poole

Course development – A Legitimate scholarly pursuit

E. H. Wilson

Diseño no estimula interés en ciencias y carreras científicas.

Memorización de teorías sustituye memorización de datos químicos.

Report on “New Directions in the Chemistry Curriculum”

H. Bent et al.

The development of chemistry teaching: A changing response to changing demand

E. H. Wilson

Antes se conocía poco sobre cómo aprenden las personas.

What we teach our freshmen in chemistry

Jacob Cornog and J. C. Colbert

Mezcla de contenidos enciclopédicos y desconectados.



“A nadie se debería permitir dar clases si no ha estudiado algo de pedagogía.”

“Muchos de los problemas que identificamos en los 70s están todavía ahí a pesar de 40 años de investigación. Esto nos debería decir algo sobre la dirección que hemos tomado y la necesidad de cambio.”

You Can't Get There from Here.

A. H. Johnstone



2010

¿Está todo perdido?



Reaching Students

What Research Says About Effective Instruction
in Undergraduate Science and Engineering

Nancy Kober

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES



**Práctica docente basada en la
evidencia de investigación.**

DBER → EBIPs

¿Cómo se enseña/aprende?

¿Qué se enseña/aprende?

2015

Reforming a Large Foundational Course: Successes and Challenges

Vicente Talanquer*^{ID} and John Pollard

CHEMICAL THINKING



2013

Chemistry, Life, the Universe, and Everything: A New Approach to General Chemistry, and a Model for Curriculum Reform

Melanie Cooper** and Michael Klymkowsky†



2021

The American Chemical Society General Chemistry Performance Expectations Project: From Task Force to Distributed Process for Implementing Multidimensional Learning

Samuel Pazicni*, Donald J. Wink, Ashley Donovan, John A. Conrad, Joshua P. Darr, Rachel A. Morgan Theall, Dana L. Richter-Egger, Adrian Villalta-Cerdas, and Deborah Rush Walker



UN CUERPO 10 EN

1 MINUTO

Cómo recuperar tu figura con estiramientos
sencillos de 1 minuto al día



*Best
seller en
Japón*

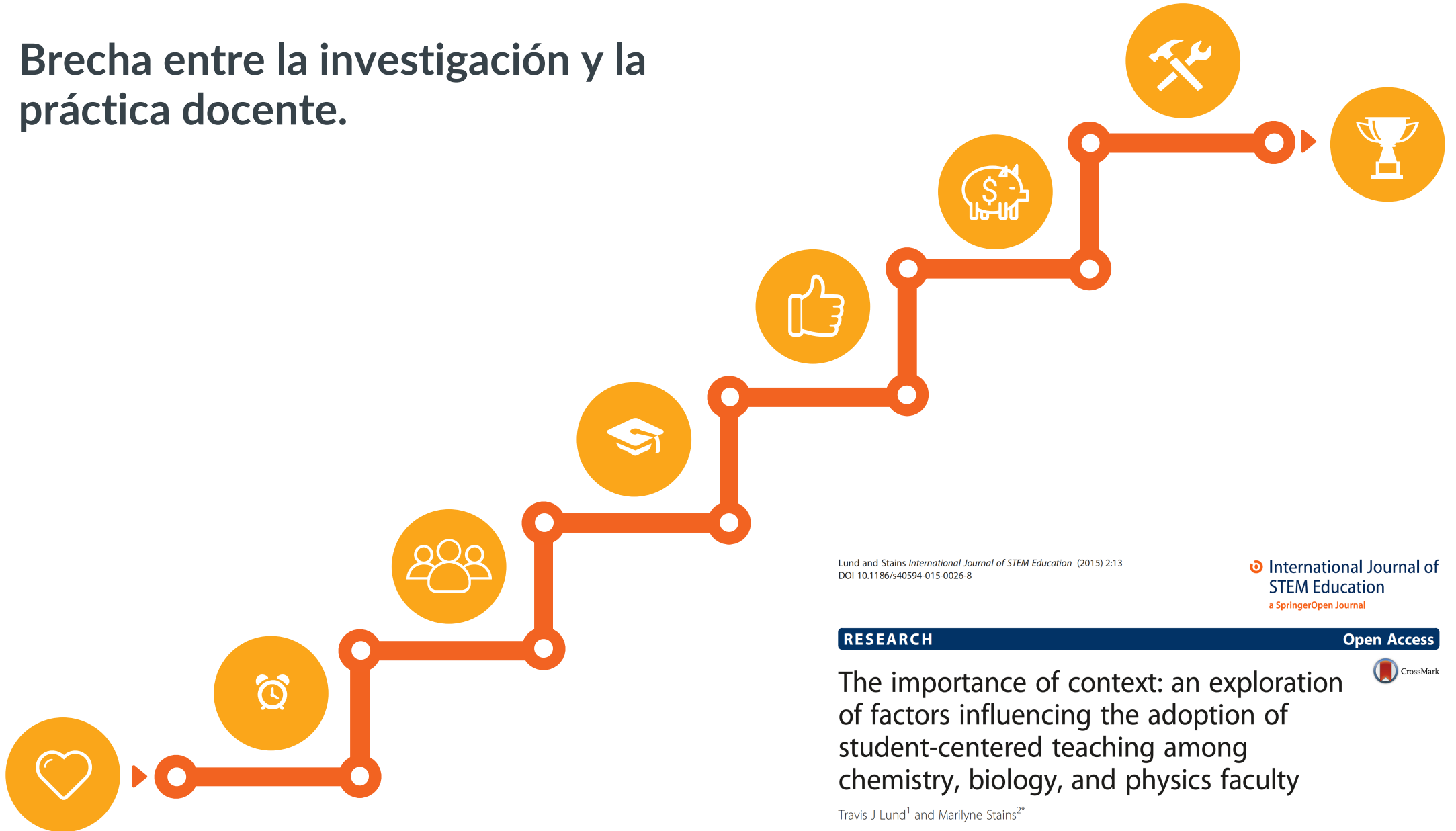
Artículo de
investigación.



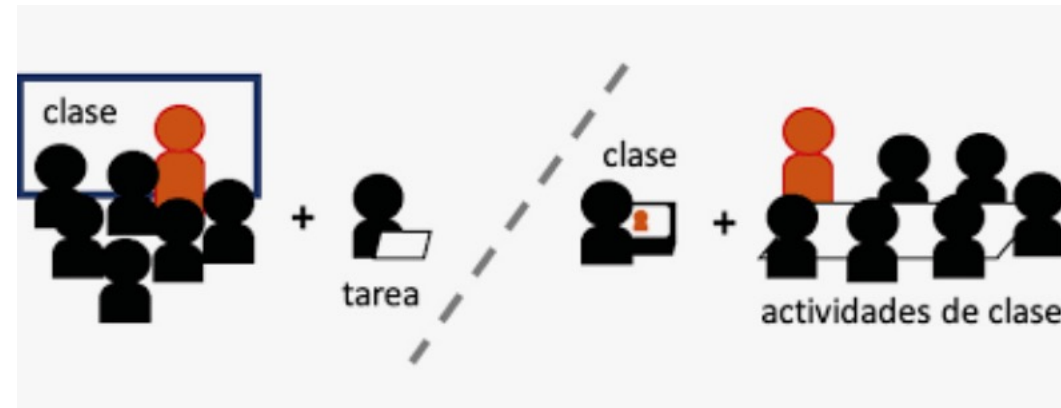
Ecología educativa
auténtica.

Práctica docente.

Brecha entre la investigación y la práctica docente.



Práctica Docente



Investigación

Flip YOUR Classroom

Reach Every Student
in Every Class Every Day

Jonathan Bergmann
Aaron Sams

(2012)

iste. ASCD

Survey Confirms Growth of the Flipped Classroom

📅 November 20, 2013 ✍️ Mary Bart

A survey conducted by the [Center for Digital Education](#) and [Sonic Foundry](#) found that 29 percent of faculty are currently using the flipped classroom model of instruction, with another 27 percent saying they plan to use it within the next 12 months.

Chemistry Education Research and Practice



REVIEW ARTICLE

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Cite this: *Chem. Educ. Res. Pract.*,
2015, 16, 758

Flipped learning in higher education chemistry: emerging trends and potential directions

Michael K. Seery

Future of the Flipped Classroom in Chemistry Education: Recognizing the Value of Independent Preclass Learning and Promoting Deeper Understanding of Chemical Ways of Thinking During In-Person Instruction

Jack F. Eichler*

✓ Cite this: *J. Chem. Educ.* 2022, 99, 3, 1503–1508

Publication Date: February 15, 2022 ▾

<https://doi.org/10.1021/acs.jchemed.1c01115>

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[Educational Research Review 28 \(2019\) 100281](#)



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Educational Research Review

journal homepage: www.elsevier.com/locate/edurev



Thematic Review

Effects of flipping the classroom on learning outcomes and satisfaction: A meta-analysis

David C.D. van Alten*, Chris Phielix, Jeroen Janssen, Liesbeth Kester

Utrecht University, the Netherlands



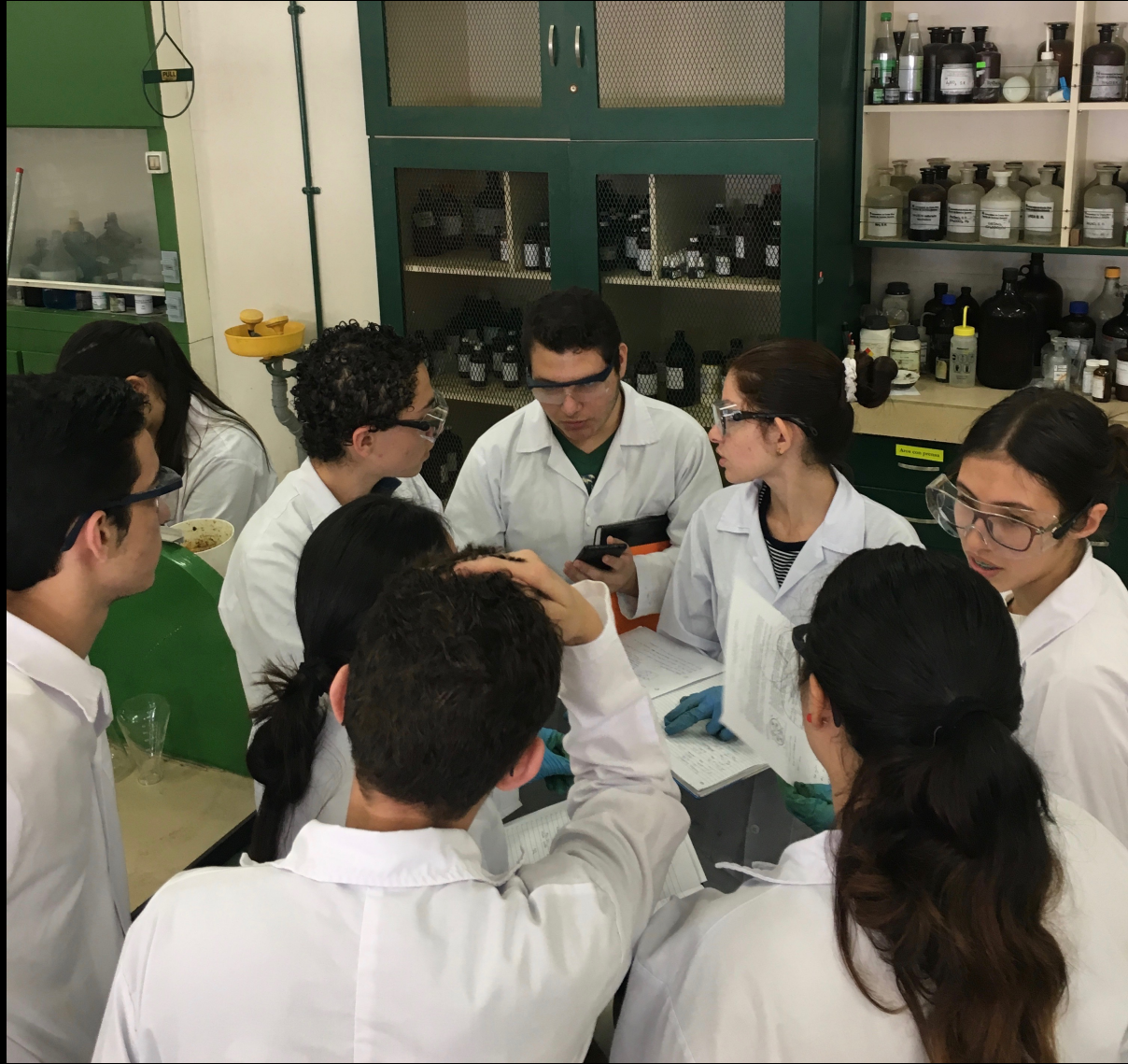
Active learning increases student performance in science, engineering, and mathematics

Scott Freeman^{a,1}, Sarah L. Eddy^a, Miles McDonough^a, Michelle K. Smith^b, Nnadozie Okoroafor^a, Hannah Jordt^a, and Mary Pat Wenderoth^a



Aprendizaje “*activo*” es práctica validada empíricamente.





¿Cómo se enseña/aprende?

¿Qué se enseña/aprende?

¿Quién enseña/aprende?

Factors Contributing to the Development of Graduate Teaching Assistant Self-Image

Santiago Sandi-Urena* and Todd Gatlin

Department of Chemistry, University of South Florida, Tampa, Florida 33620, United States

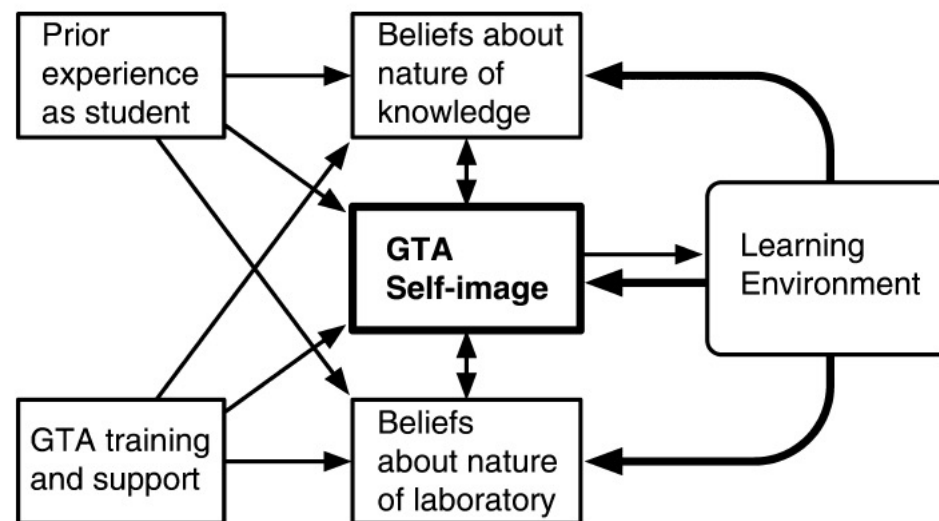
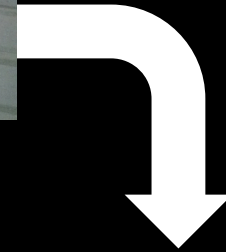


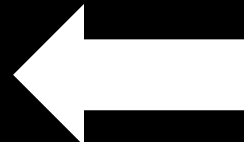
Figure 2. Factors associated with GTA self-image development.



La pasividad es una respuesta al ambiente de aprendizaje.



Aprendizaje “activo” validado empíricamente.



Santiago Sandi-Urena¹ / Giovanni Loría Cambroneró¹ / Dayanna Jinesta Chaves¹

Conceptualisation of Lewis structures by chemistry majors

¹ University of Costa Rica, School of Chemistry, Ciudad Universitaria Rodrigo Facio San Pedro de Montes de Oca, San Jose 2060, Costa Rica, E-mail: guillermo.sandiurena@ucr.ac.cr. <https://orcid.org/0000-0003-3343-174X>.

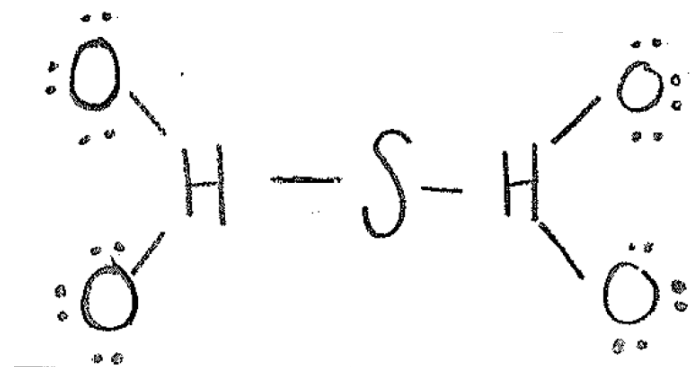
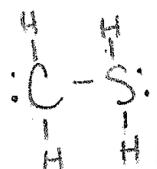


Table 1: Percentage correct by group for Lewis structures in Items 1 and 2.

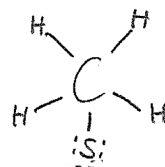
Course (n)	Formula										Average
	H ₂ SO ₄	SO ₄ ²⁻	CuCl ₂	CNO ⁻	NaCNO	NH ₂ ⁻	NO	CH ₄ S	C ₂ H ₆ O	C ₃ H ₇ NO	
GC2 (50)	63	56	7	10	8	76	33	56	69	36	41
OC1 (19)	56	67	50	56	44	40	10	60	70	20	47
OC2 (36)	61	78	33	78	61	63	21	63	58	47	56
COC (17)	67	83	67	50	33	90	40	70	70	60	63

1228C

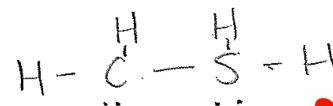
CH₄S



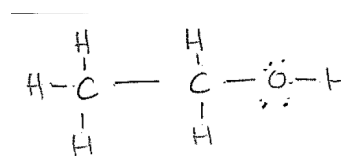
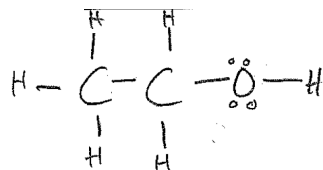
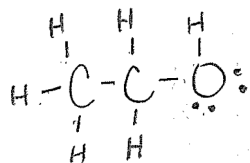
7023N



9009C



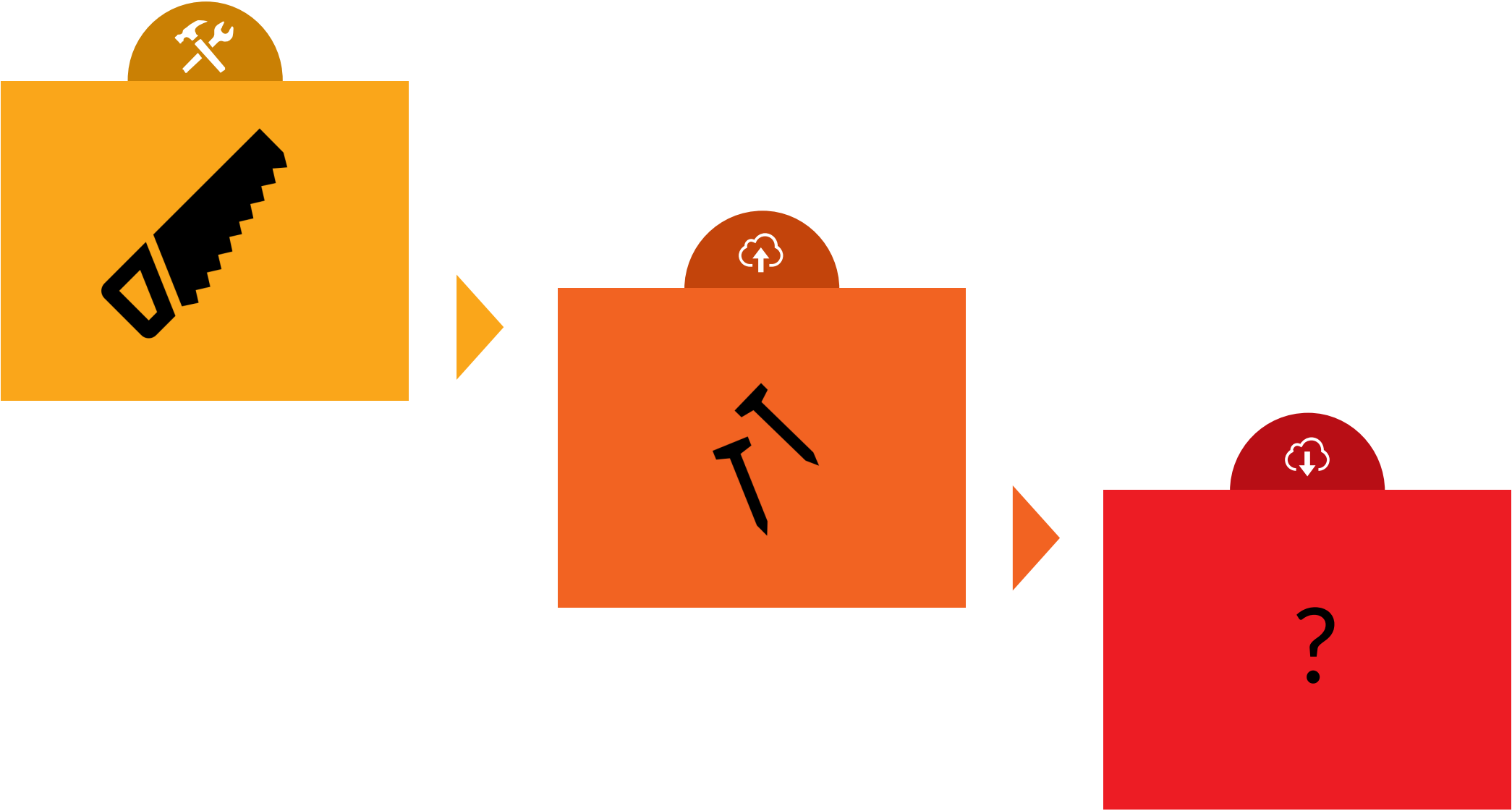
C₂H₆O



Hipótesis central de las ciencias cognitivas



Hipótesis central de las ciencias cognitivas



Resuelva

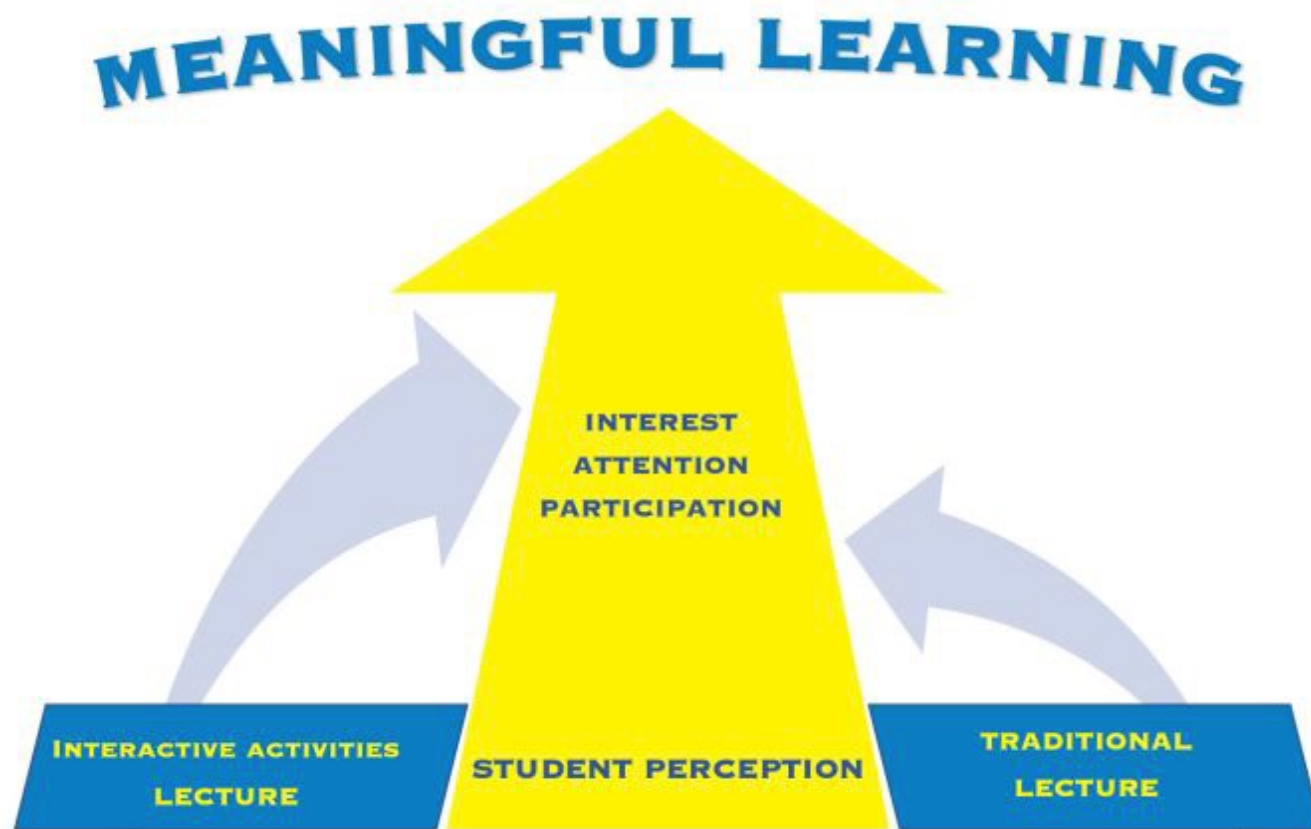
$$\frac{16}{64} = \frac{1}{4}$$

Muestre procedimiento

$$\frac{\cancel{16}}{\cancel{64}} = \frac{1}{4}$$

Uso de actividades interactivas en clase para promover la atención, el interés, y la generación de explicaciones en Química General de alta matrícula.

S. Sandi-Urena, B. Fernández Solano, A. García-Piñeres



Actividades interactivas:

(Re)Diseñar actividades en el aula.

Sencillas pero efectivas.

Anidar en estilo magistral.

Mejorar sin desplazar.

Implementar fácilmente.

Consistente con recursos docentes.

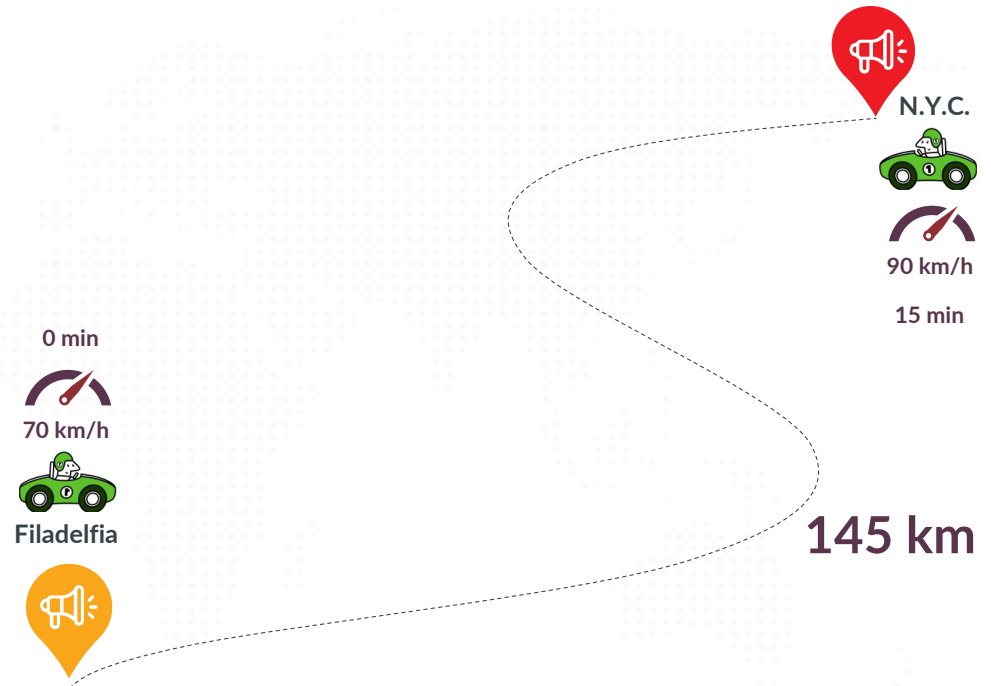
Catalizar reforma.

Persuasión gradual



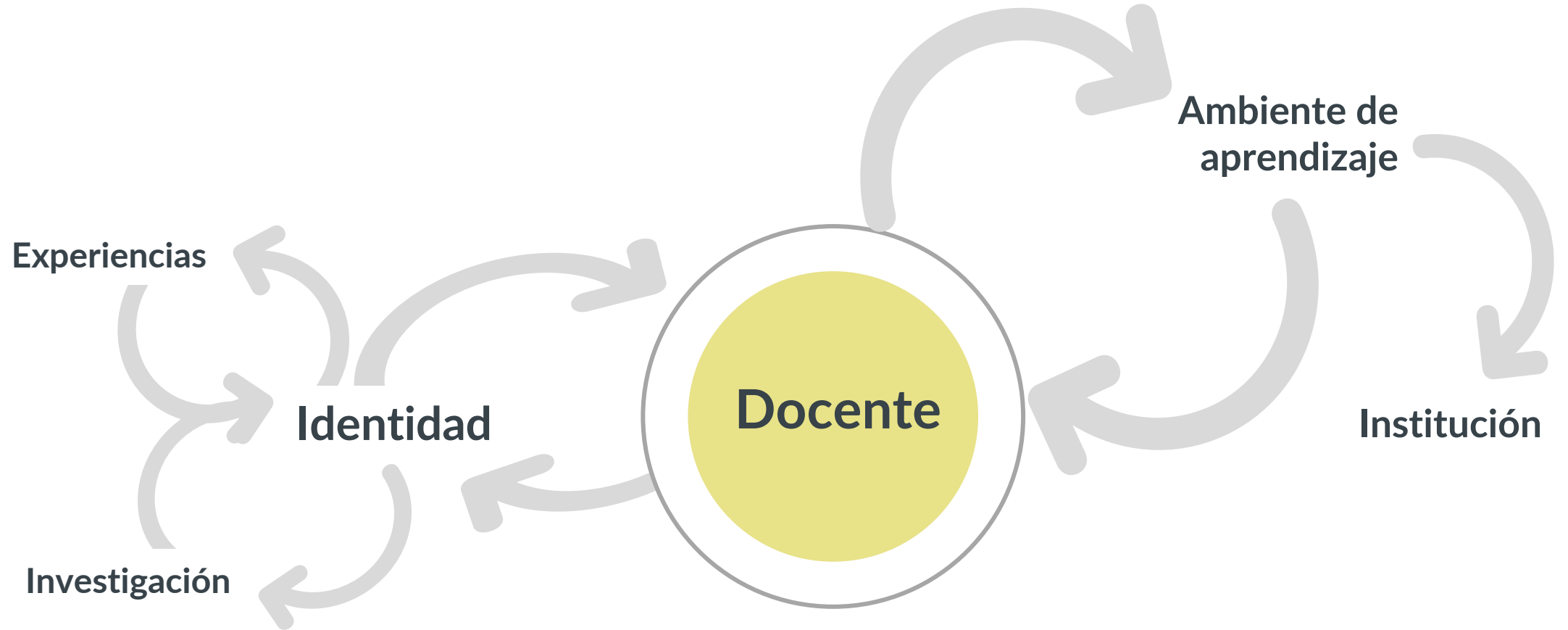


Solución de problemas



¿Cómo atendemos el problema de la educación?

Del aula a la institución: repensando la práctica docente en Química.



¡GRACIAS!



www.santiagosandi-urena.com



It Pentcchalmctim ?

: m electione solt rndolt
I gacnition irt akvairtata dom denwrt
neirhaesterttrilo of-pianfista Entmiamme!

Dall-E