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INTRODUCTION

Intuition is pivotal in **guiding students' problem-solving approaches**. The perspective on what intuition is varies across disciplines and studies. This is mirrored in a diverse body of educational research, e.g. [1-3].

The aim of this work is **not to redefine intuition**. Rather, we focus on how students *respond to, or manage, their intuitions* during problem solving.

We challenge the notion that intuition is static or exclusive to either experts or novices. Instead, we adopt a **resources perspective** [4], defining intuition as *the manifestation of one's tacit knowledge, triggered by rapid interpretation of one's surroundings and influenced by one's beliefs and values* [5].

This case study is part of an **ongoing collaboration** between PER and CER, exploring the **research question**:

How do beyond-intro level chemistry and physics students respond to their intuitions during collaborative problem solving?

METHODOLOGY

We employed a **grounded approach** and reanalyzed data from our previous studies. In physics, we previously explored and categorized challenges faced by groups of third-year undergraduate students solving problems on the topic of **statistical mechanics** [6]. In chemistry, we investigated second-year undergraduate students solving problems in **chemical kinetics** [7].

We initially pinpointed instances where students either implicitly or explicitly relied on their intuitions. This was followed by a **joint inductive analysis** to identify themes that emerged across both datasets.

EMPIRICAL FINDINGS

Students' response to their intuitions can significantly impact their **task success**, and their potential to turn those moments into **learning opportunities**. This is regardless of the intuition's "correctness". We present episodes of productive and unproductive responses to intuition from both the physics and chemistry context.

IMPLICATIONS & FUTURE WORK

Based on our findings, we recommend teachers to: **adopt a flexible stance** toward intuition; **explicitly incorporate the topic of intuition** in classroom discussions; and **encourage students to actively reflect** on their intuitions.

Future studies should consider the processes governing the development of intuition and expand research on students' epistemological views on intuition.

REFERENCES

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Managing **intuition** in collaborative problem solving: a case study of beyond-intro physics and chemistry students

STUDENTS RELY ON THEIR INTUITIONS DURING PROBLEM SOLVING...

... AND THEIR RESPONSE IS IMPACTFUL!

UNPRODUCTIVE RESPONSE (PHYSICS)

1 Yeah. But is it, is this incorrect, the 'E=0'?

2 Well it doesn't map with our intuitive answer [conceptual discussion about the problem]

3 Yeah, but I feel like our intuition is still right.

4 Okay, so do we say this is, our value is correct or our intuition is correct? Maybe we could look in our calculation again?

5 Yeah, maybe we made a mistake somewhere.

FIONA, FILIP, FRAN

$$Z = \sum e^{-\beta \epsilon_i} = e^{-\beta 0} + e^{-\beta \epsilon} + e^{-\beta \epsilon}$$

$$Z = \sum_i \frac{1}{\epsilon_i} (e^{-\beta \epsilon_i} + 1) = 4 \cos^2(\theta) + 4 \cos^2(\theta) + 1$$

$$E = -\frac{\partial}{\partial \beta} \ln Z = -\frac{\partial}{\partial \beta} \ln (8 \cos^2(\theta) + 1)$$

$$= -\frac{\partial}{\partial \beta} \ln (e^{\beta \epsilon} + e^{-\beta \epsilon} + 1) = -\frac{1}{e^{\beta \epsilon} + e^{-\beta \epsilon} + 1} \cdot (-\epsilon e^{\beta \epsilon} + \epsilon e^{-\beta \epsilon})$$

$$= \frac{\epsilon (e^{\beta \epsilon} - e^{-\beta \epsilon})}{e^{\beta \epsilon} + e^{-\beta \epsilon} + 1}$$

High $\beta \ll 1$ Low $\beta \gg 1$

UNPRODUCTIVE RESPONSE (CHEMISTRY)

equilibrium constant!

We're happy with this one!

At each crossroad, Jacob and Jonathan blindly trusted their intuition. This led them astray!

$$\frac{d[O_2]}{dt} = k_2 [C_6H_5CO_3H] \left[K \frac{[C_6H_5CO_3H]}{[H^+]} \right]$$

equilibrium constant!

$$\frac{d[O_2]}{dt} = \frac{k_1 k_2 [C_6H_5CO_3H]^2}{k_{-1} [H^+] + k_2 [C_6H_5CO_3H]}$$

Appropriate answer

PRODUCTIVE RESPONSE (PHYSICS)

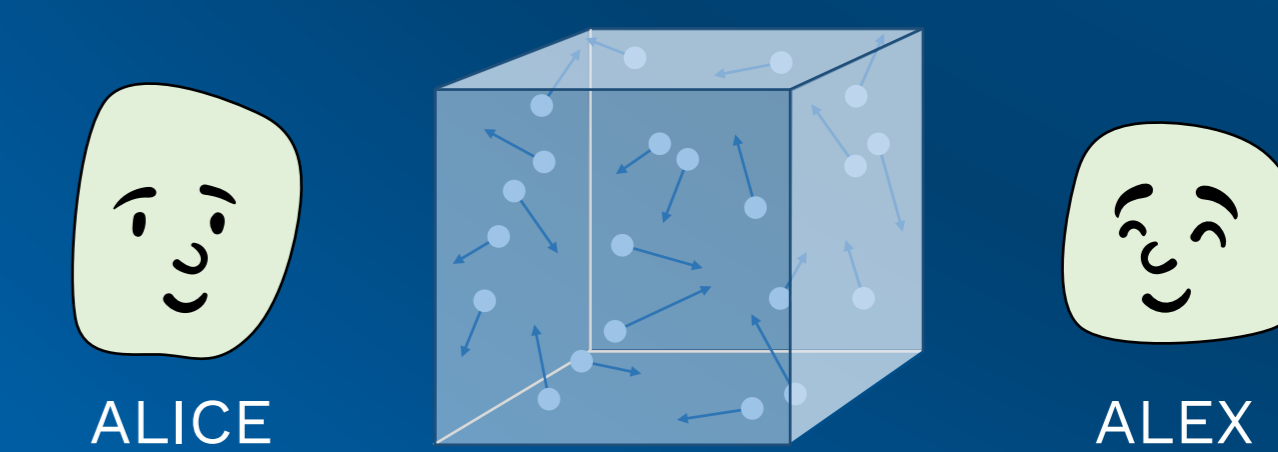
1 I just have, my gut-feeling... since [laughs].

2 Your physical intuition [laughs].

3 Yeah yeah, but shouldn't the energy be as spread out as possible? [...] When it's in equilibrium, that's like my intuitive understanding of what equilibrium means.

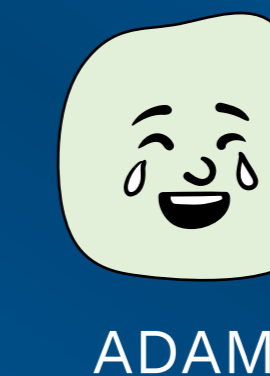
ADAM, ALEX

GAS IN A BOX ANALOGY



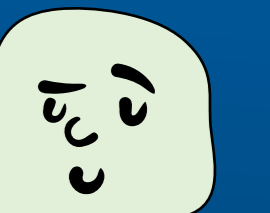
4 Yeah yeah, I agree, I agree. I also think that that [points to their original answer] is the correct one. But my gut-feeling tells me that the energy should be spread out. Eh, but I agree with, I still agree with what we say and I wouldn't change it. [...] It's just how I, my conceptual understanding [jokingly] of thermodynamic equilibrium, which is obviously wrong [laughs].

5 I mean, it is probably because it's so few states, right? Like we wouldn't look at a gas with like [...] 1 mole of like, molecules, and you wouldn't expect them all to have exactly the same speed. That to me feels like, super-unintuitive as well.



ADAM

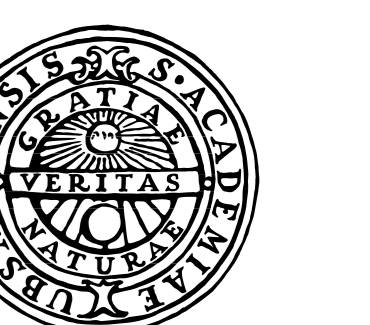
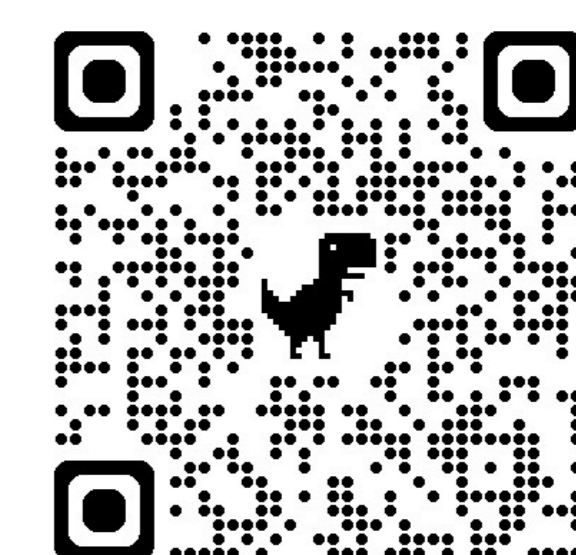
6 Yeah yeah. And also you wouldn't look at a gas and say "that particle has all the energy" [laughs].



ALEX

STUDENTS NEED STRATEGIES TO MANAGE THEIR INTUITIONS

WE SHOULD PAY ATTENTION TO ONTOLOGICAL AND EPISTEMOLOGICAL PERSPECTIVES ON INTUITION



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