



Bochum University  
of Applied Sciences  
TECHNOLOGY BUSINESS HEALTH



# The Never- Skilled Generation

Deskilling, Cognitive Offloading and the Long-Term Risks of AI- Supported Learning

Jonas Schug / Bochum University of Applied Science



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# The Never- Skilled Generation

Deskilling, Cognitive Offloading and the Long-Term Risks of AI- Supported Learning

(and a Solution?)

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# The Aim of Higher Education?

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Universities teach two things:

## **Knowledge**

what students need to know

## **Competence**

what students need to do with it

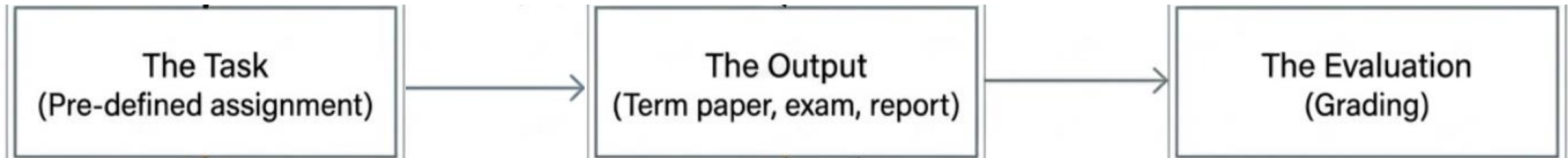
# Higher Education Chain of Inference

The Task  
(Pre-defined assignment)

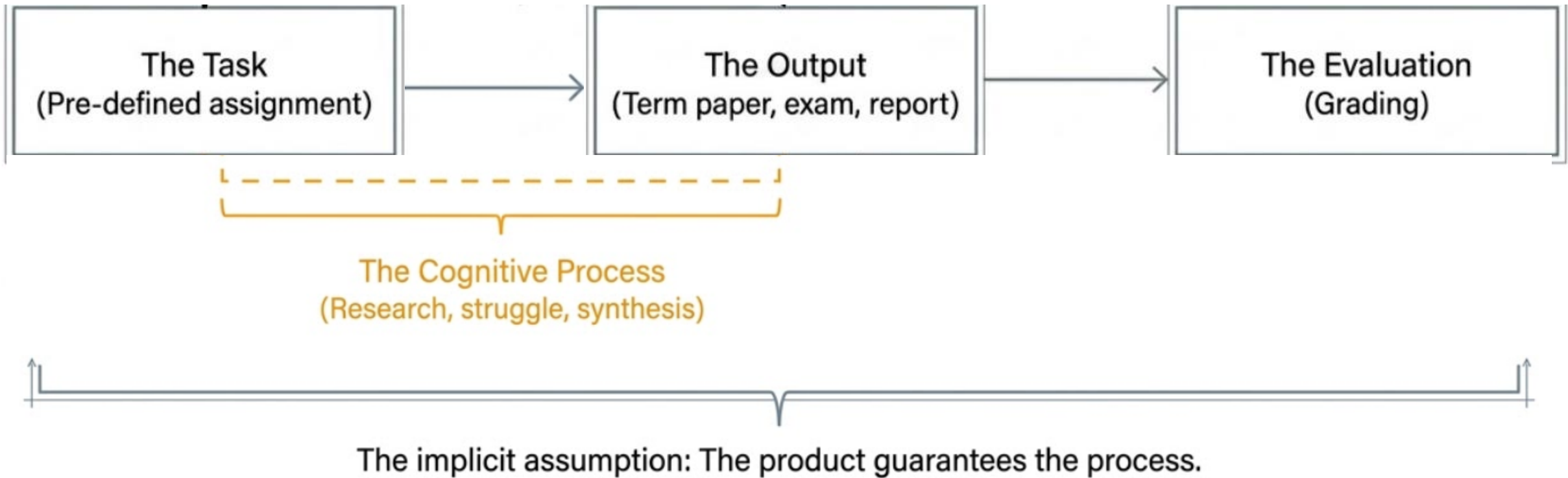
# Higher Education Chain of Inference



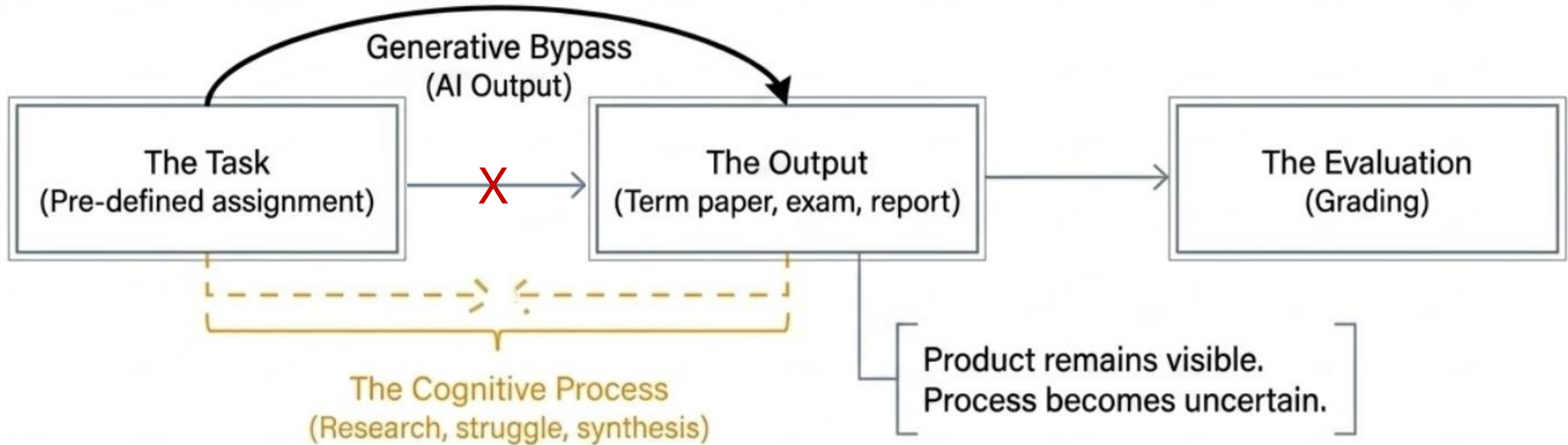
# Higher Education Chain of Inference



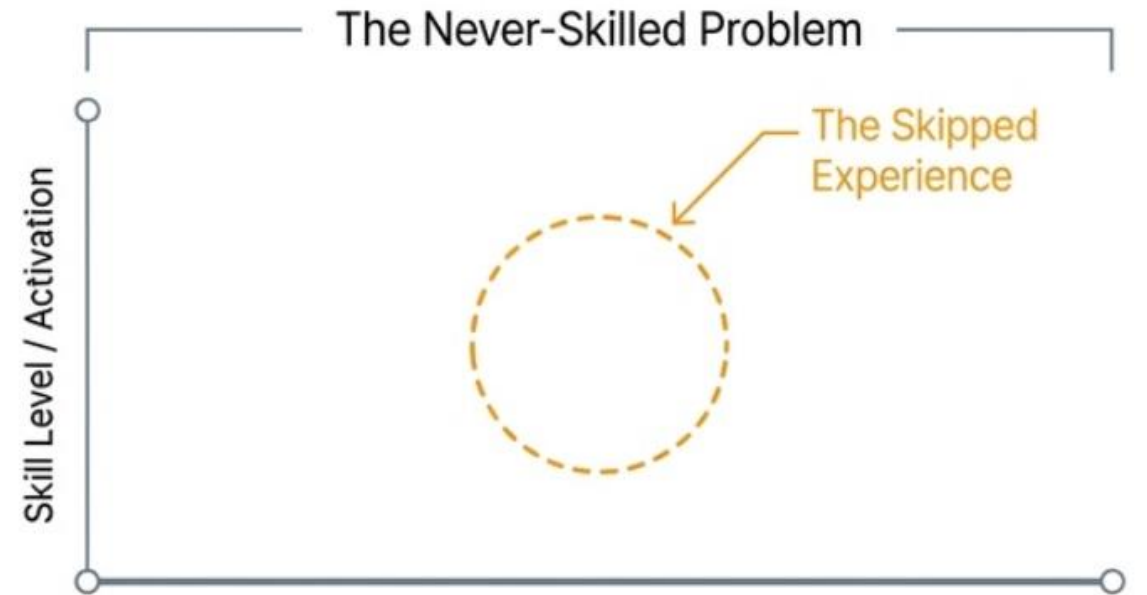
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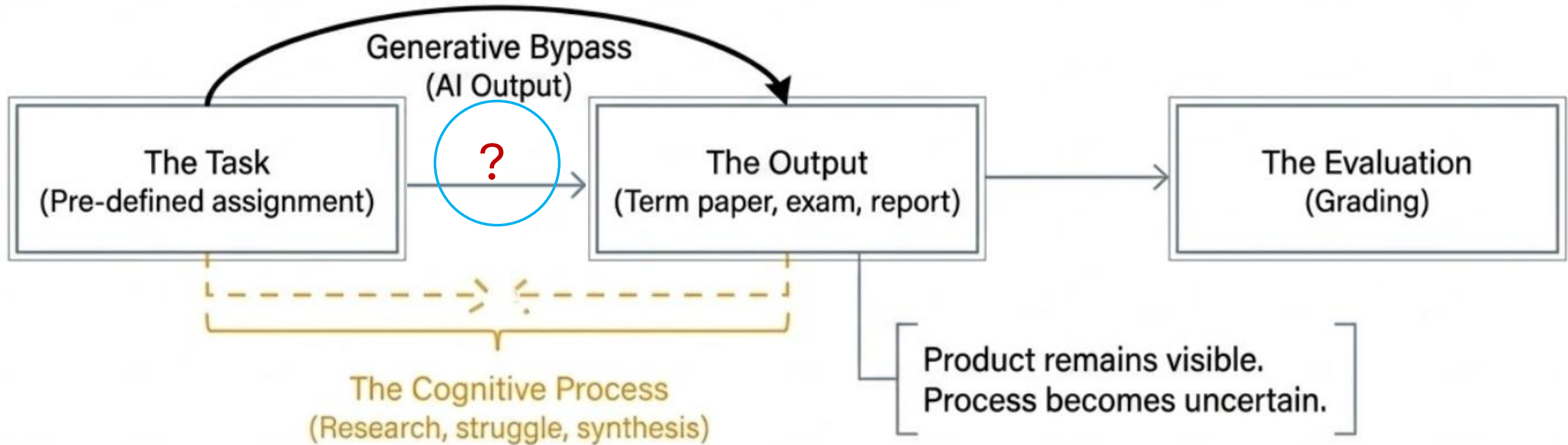
# Higher Education Chain of Inference



# The Never-Skilled-Problem:



# Higher Education Chain of Inference

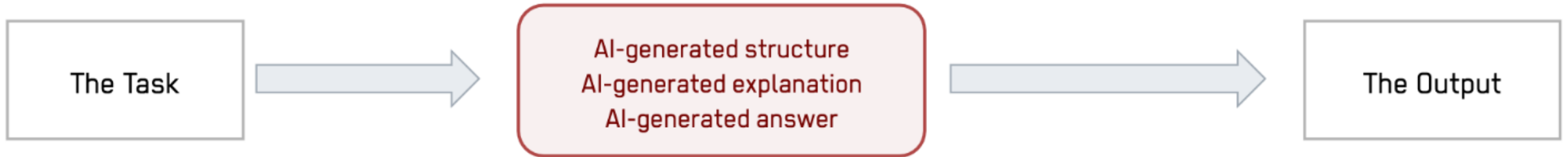


# The Sequencing Timeline Metaphor

## Learning process



# No struggle (with AI):



Potentially shortened: search time • persistence • retrieval • error correction • self-explanation

## Bastani et al. (2025)

GPT-4 improved practice performance.  
Without guardrails, later independent performance declined.  
A scaffolded tutor mitigated the effect.

## Rismanchian et al. (2026)

"Faster completion, less learning."  
AI-susceptible tasks were completed faster.  
Proctored retention performance declined.

## Barcaui (2025)

ChatGPT-supported learning  
led to lower delayed retention  
after 45 days.

# The Sequencing Timeline Metaphor

## Learning process

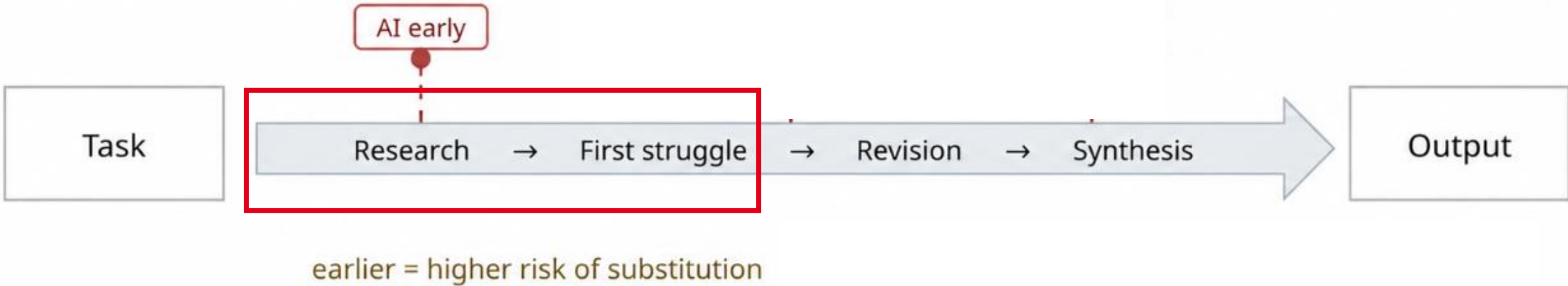
Task

Research → First struggle → Revision → Synthesis

Output

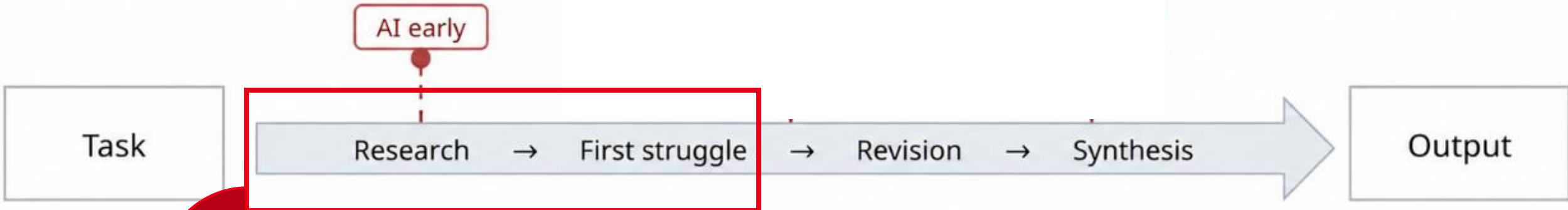
# The Sequencing Timeline Metaphor

## Learning process



# The Sequencing Timeline Metaphor

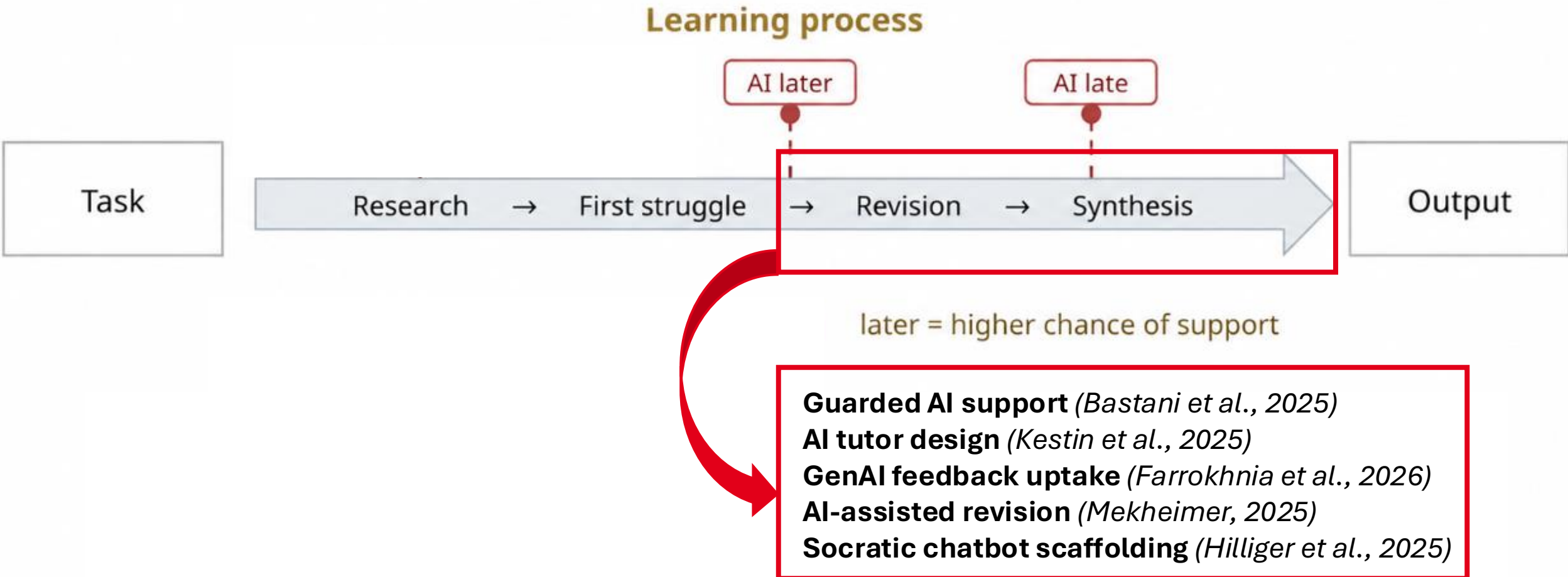
## Learning process



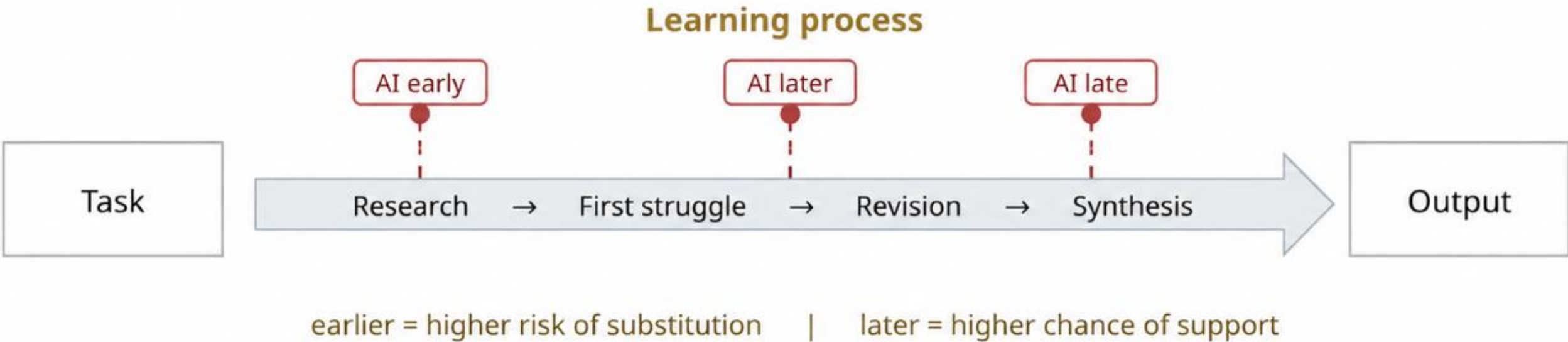
earlier = higher risk of substitution

**Prior knowledge activation** (Loibl et al., 2017)  
**Productive failure** (Kapur, 2008)  
**Generation effect** (Slamecka & Graf, 1978)  
**Retrieval practice** (Karpicke & Blunt, 2011)  
**Desirable difficulties** (Bjork & Bjork, 2011)

# The Sequencing Timeline Metaphor



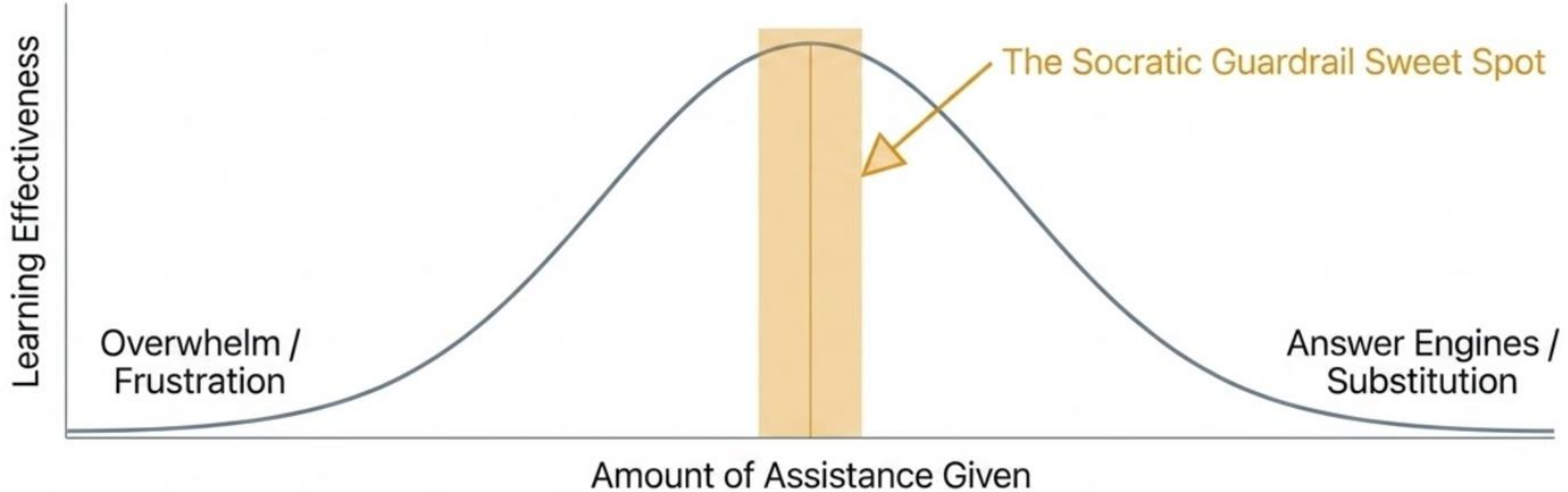
# The Sequencing Timeline Metaphor



**AI is not necessarily harmful to learning.**

What matters is when it enters the process.

# The Assistance Dilemma Curve



Koedinger & Alevan (2007); Wood, Bruner, & Ross (1976)

# Our (proposed) solution....

**Knowledge**

**Competence**

# Our (proposed) solution....

## Knowledge

### WOTUM

AI teaching & learning agent

## Competence

# Our (proposed) solution....

## Knowledge

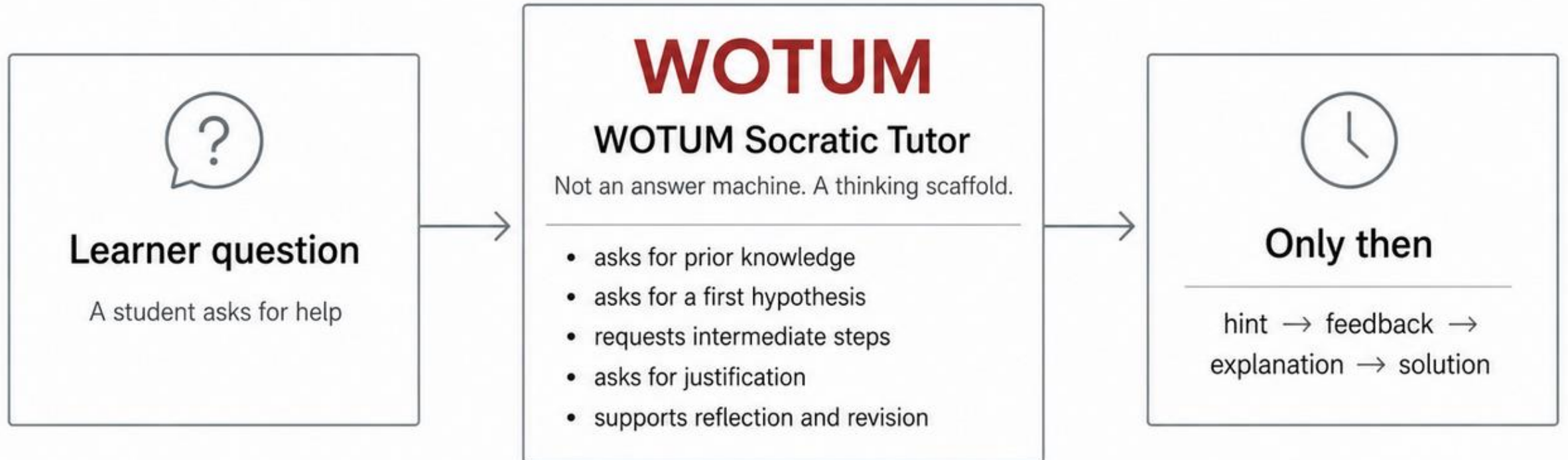
### WOTUM

AI teaching & learning agent

- configured with Socratic guidelines
- no direct answer first
- knowledge on demand

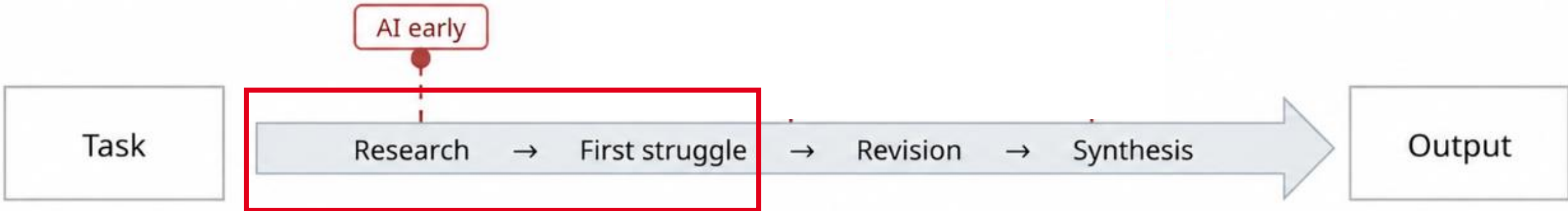
## Competence

# AI Learning Agent with Guidelines



# The Sequencing Timeline Metaphor

## Learning process



earlier = higher risk of substitution



**Socratic Chatbot refuses to answer!**

# AI Learning Agent with Guidelines

**WOTUM**  
Write Once - Transfer - Use Multiple

## Configured by teachers

- learning goals and criteria
- materials and references
- feedback and control logic
- local / GDPR-compliant deployment

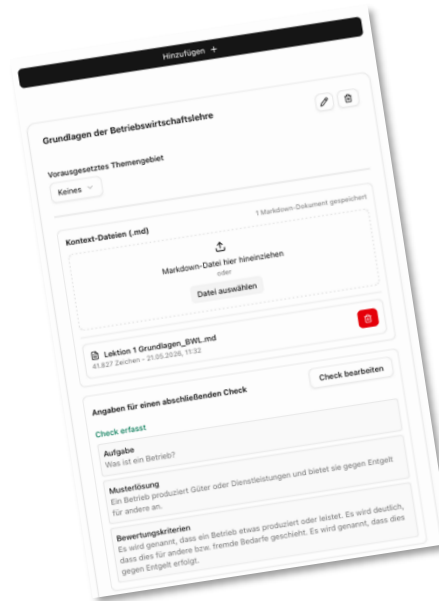
## Socratic guidelines

- ask for own hypothesis first
- request intermediate reasoning
- give hints before solutions
- make assumptions explicit

## Learning support

- adaptive multimodal materials
- criterion-referenced feedback
- transparent references
- support within guardrails

- Developed as part of a third-party funded project
- Currently being tested in two university courses.
- Planned rollout for broader teaching use: next year.



# Our (proposed) solution....

**Knowledge**

**WOTUM**

AI teaching & learning agent

**Competence**

# Our (proposed) solution....

## Knowledge

### WOTUM

AI teaching & learning agent

## Competence

Problem-Based Learning

# Our (proposed) solution....

## Knowledge

### WOTUM

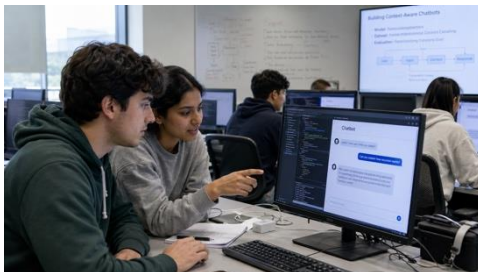
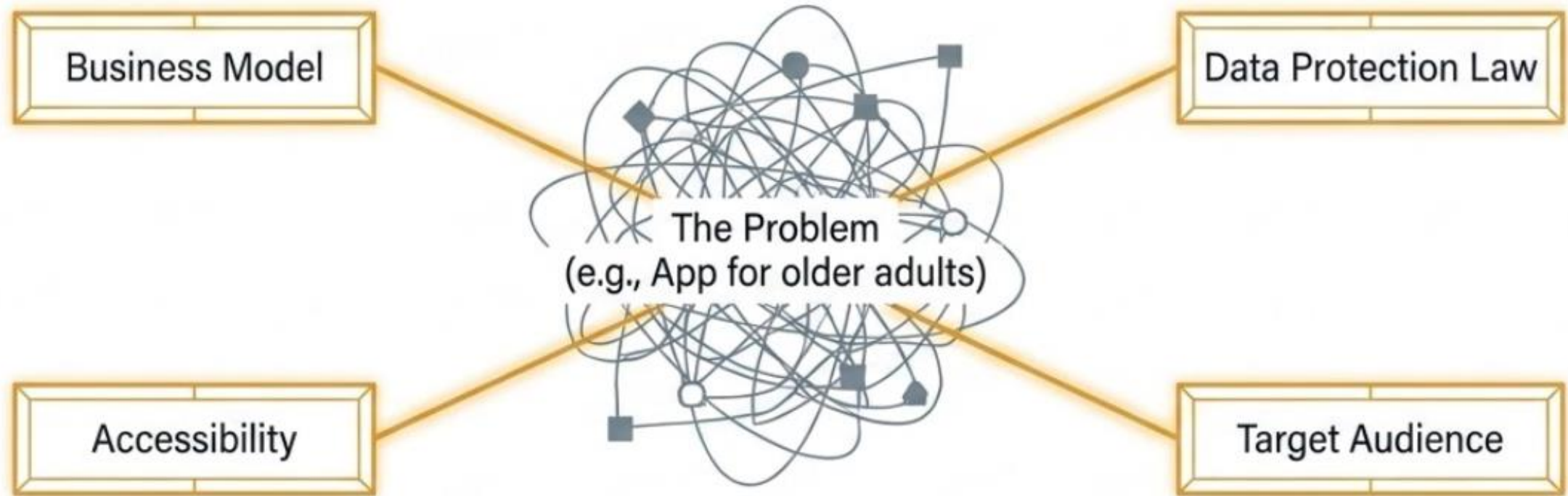
AI teaching & learning agent

## Competence

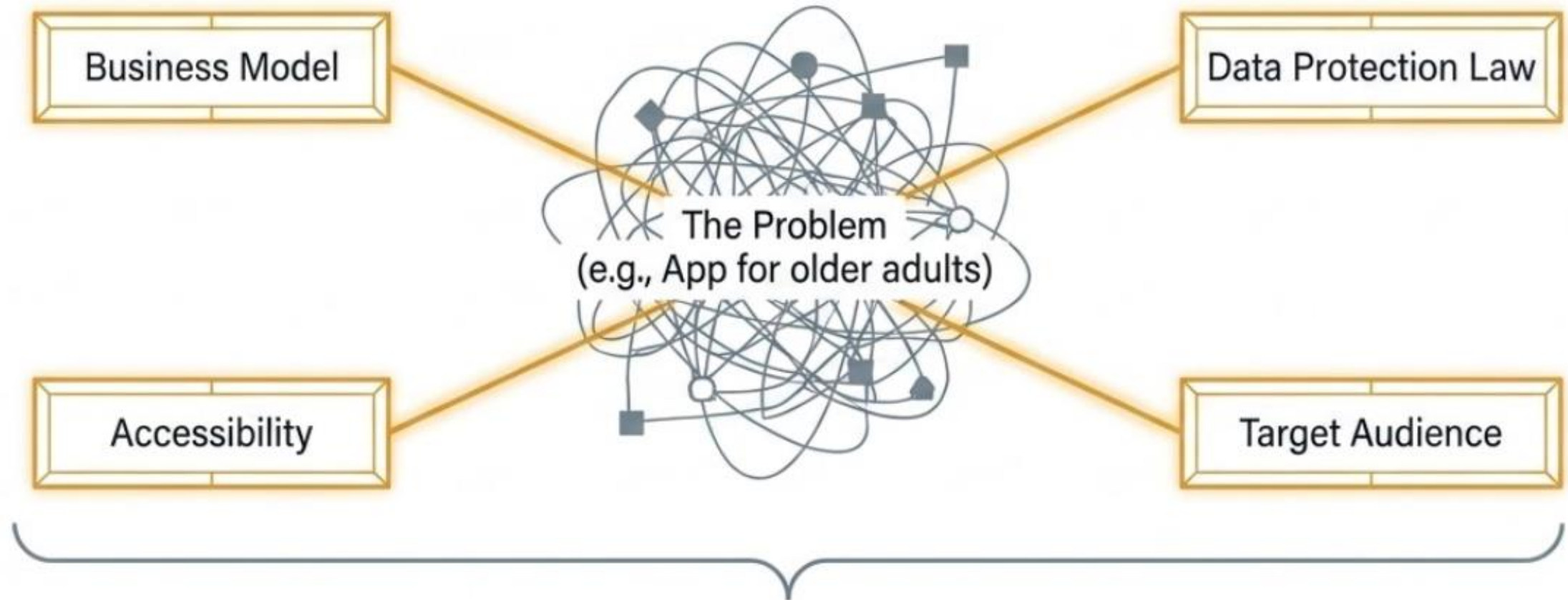
### Problem-Based Learning

- real-world projects
- ill-structured problems

For example....



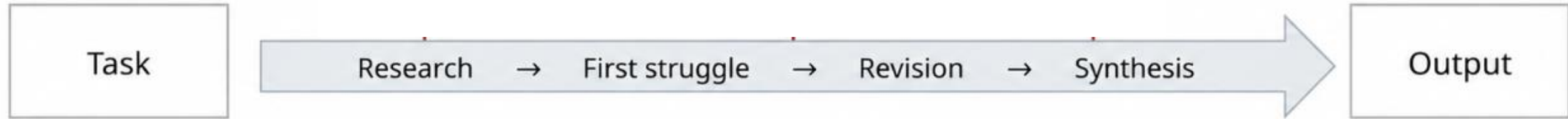
For example....



The PBL effect for GenAI: before AI can answer well, students must know what to ask.

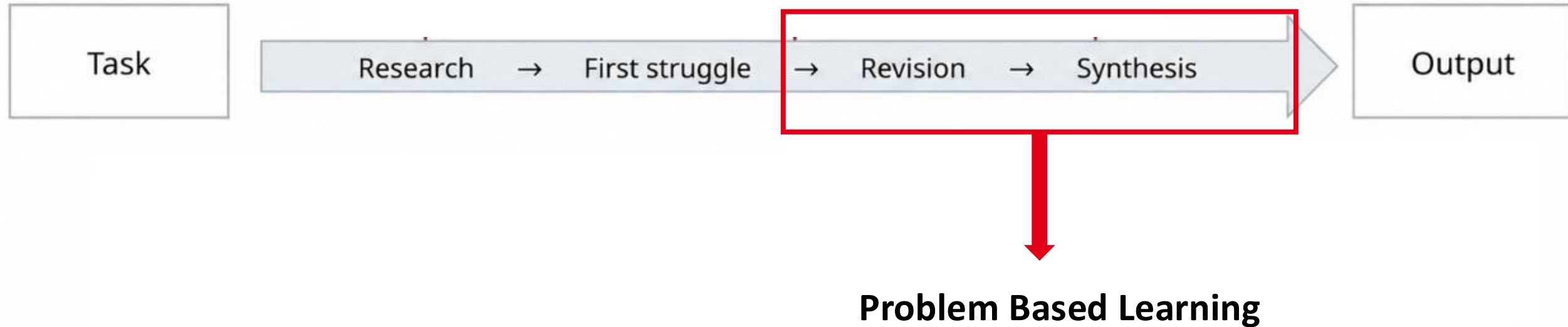
# The Sequencing Timeline Metaphor

## Learning process



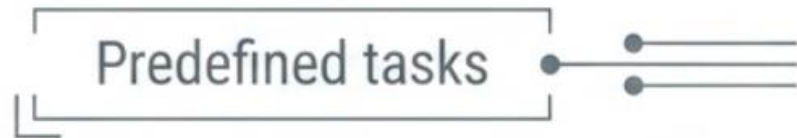
# The Sequencing Timeline Metaphor

## Learning process



# Redesign the curriculum

## Product-Oriented Curriculum



The Trigger

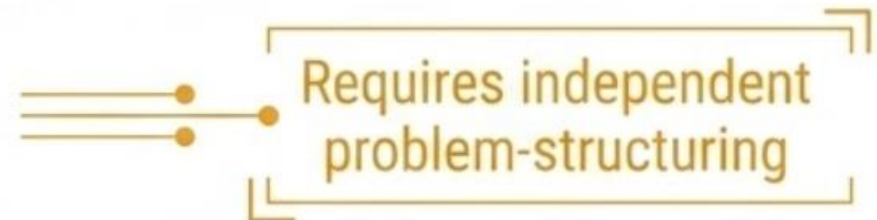


Knowledge  
Acquisition



AI Vulnerability

## Problem-Oriented Architecture



# Our (proposed) solution....

## Knowledge

### WOTUM

AI teaching & learning agent

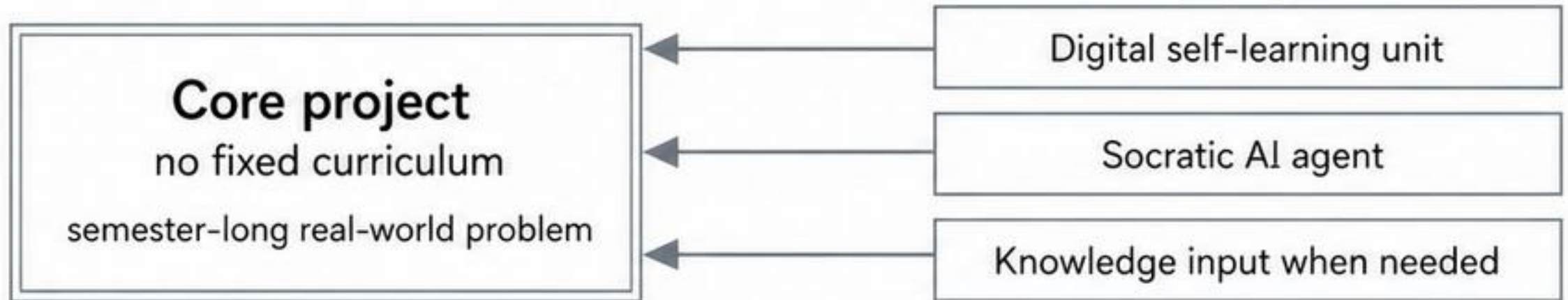
- configured with Socratic guidelines
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- knowledge on demand

## Competence

### Problem-Based Learning

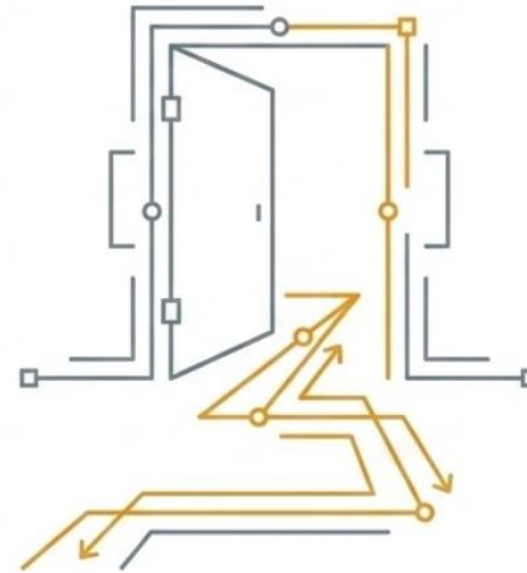
- real-world projects
- ill-structured problems
- students must formulate the question first

# Our (proposed) solution....



# Takeways?

- > Open-ended problems over fully pre-structured assignments
- > Learning agents over answer machines
- > Didactic guardrails over blanket bans
- > Delaying the solution over delaying the technology



# — *Lehrwende*

Open-access monograph on higher education in the age of generative AI



## What is Lehrwende?

Lehrwende is a scholarly open-access monograph by Roland Böttcher. It examines how generative AI is transforming higher education and why instructors, curricula, and institutions need to respond.



## Central perspective

The book focuses on how higher education can be rethought in the age of generative AI — moving beyond mere tool use toward a broader pedagogical and institutional reorientation.



## Availability

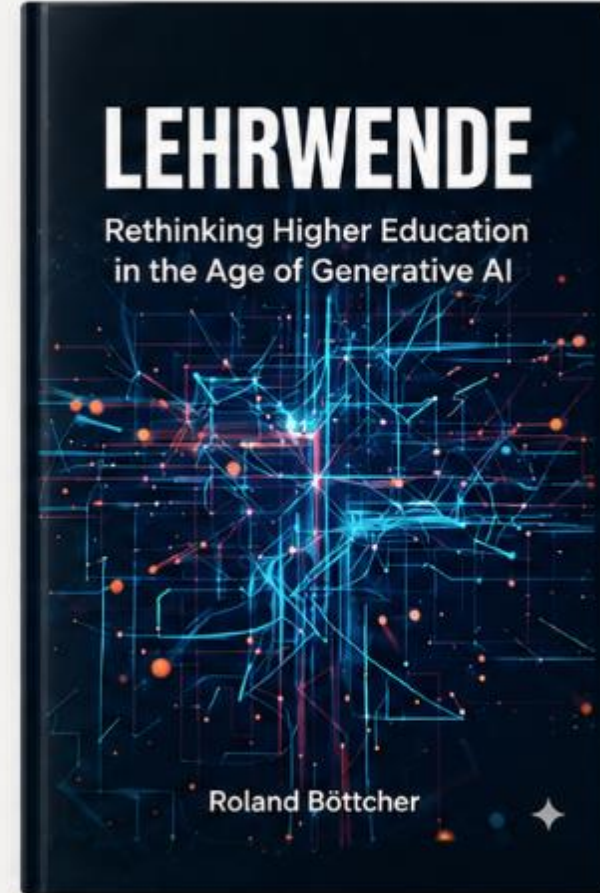
The book is open access and available online as a free download. Both a German edition and an English edition are available.



<https://lehrwende.de/>



Open access – free download available



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