

stimulating classroom inquiry through teacher training

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INQUIRY LEARNING?



what are the **characteristic features** of inquiry learning (IL)?

Pedaste et al, 2015: inquiry-based learning is an educational strategy in which students follow methods and practices similar to those of professional scientists in order to construct knowledge

Levy, Thomas, Drago, & Rex, 2013: educational scholars agree that IL provides students opportunities to answer questions through the exploration and analysis of data.

Hmelo-Silver, Duncan, & Chinn, 2007: students learn content as well as discipline-specific reasoning skills and practices (often in scientific disciplines) by collaboratively engaging in investigations

what are the **characteristic** features of inquiry learning (IL)?



IL = scientific/structured/systematic reasoning

4 key components (*Kuhn, 2010*)

- asking questions
- interpreting data
- drawing conclusions
- forming arguments

nature varies across fields (e.g., history)

- > asking historical questions
- > analyzing historical sources
- > synthesizing and contextualizing information
- > considering arguments pro and contra

what are the **characteristic** features of inquiry learning (IL)?

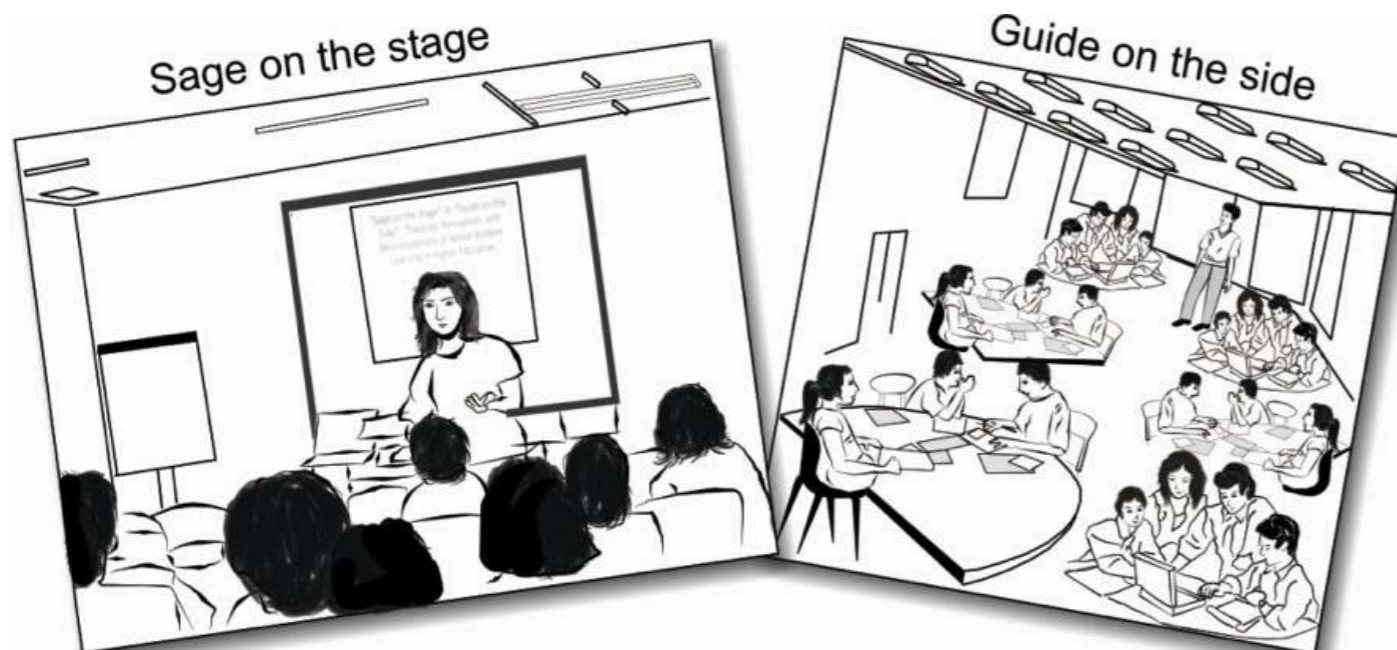


IL = scientific/structured/systematic reasoning

IL ≠ self-discovery

teachers both sage and guide!

- providing required knowledge
- just-in-time support
- bringing it all together



other **common misconceptions**:

“IL neglects content knowledge”

questions are not solved in a vacuum, but with concrete information

(Martin & Monte-Sano, 2008)

“students are not ready for IL”

the ability to reason with information seems to be set not so much by cognitive factors, but rather by the learning environment *(Booth, 1994)*

“IL is aimed at developing miniature scientists”

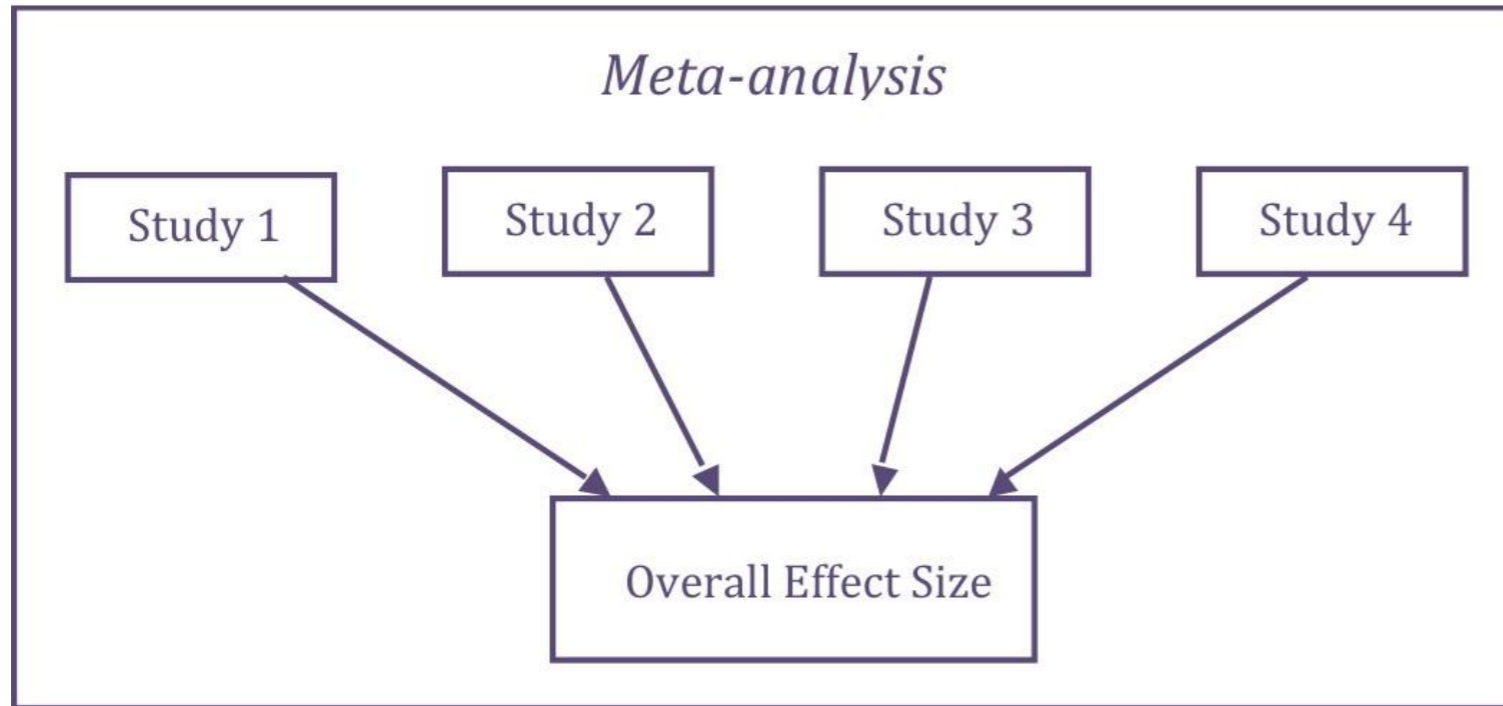
basic understanding of the systematic thinking that experts employ

(Perfetti et al., 1994)

“IL is the panacea to education”

not all topics may be equally suited to IL *(Barton, 2005)*

Large body of research on **impact on student achievement**



Several meta-analyses

(Alfieri, 2011; Furtak et al., 2012; Lazonder & Harmsen, 2016)

- IL leads to higher student achievement compared to expository teaching
- but **only** if there is sufficient teacher support!!

SITUATION IN BELGIUM



World Cup - 7/1/14

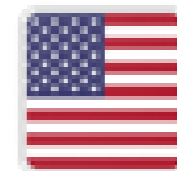
Full-time



2

-

1

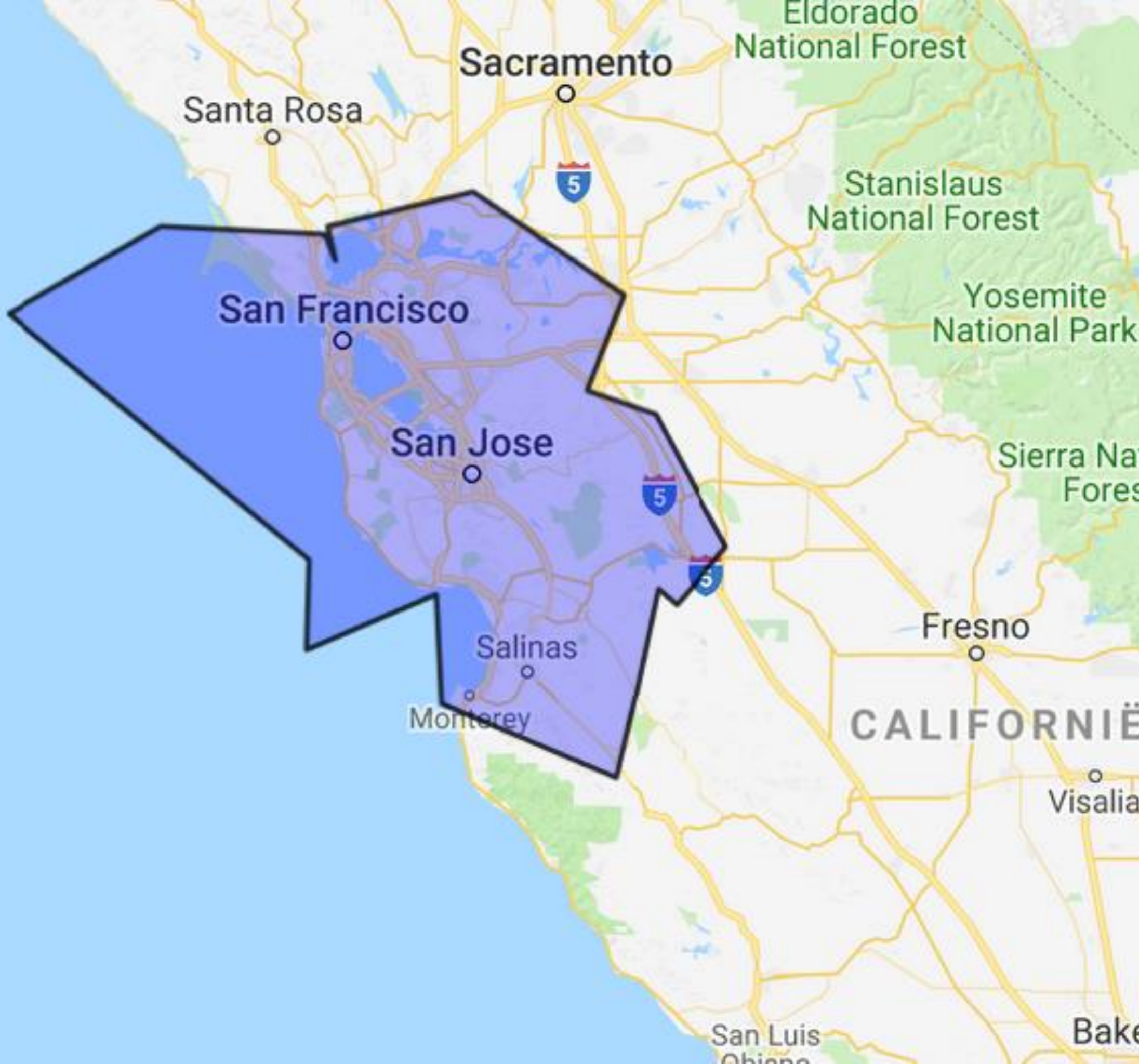


Belgium

USA

Round of 16





Sacramento

Eldorado National Forest

Santa Rosa

Stanislaus National Forest

San Francisco

Yosemite National Park

San Jose

Sierra National Forest

Salinas

Fresno

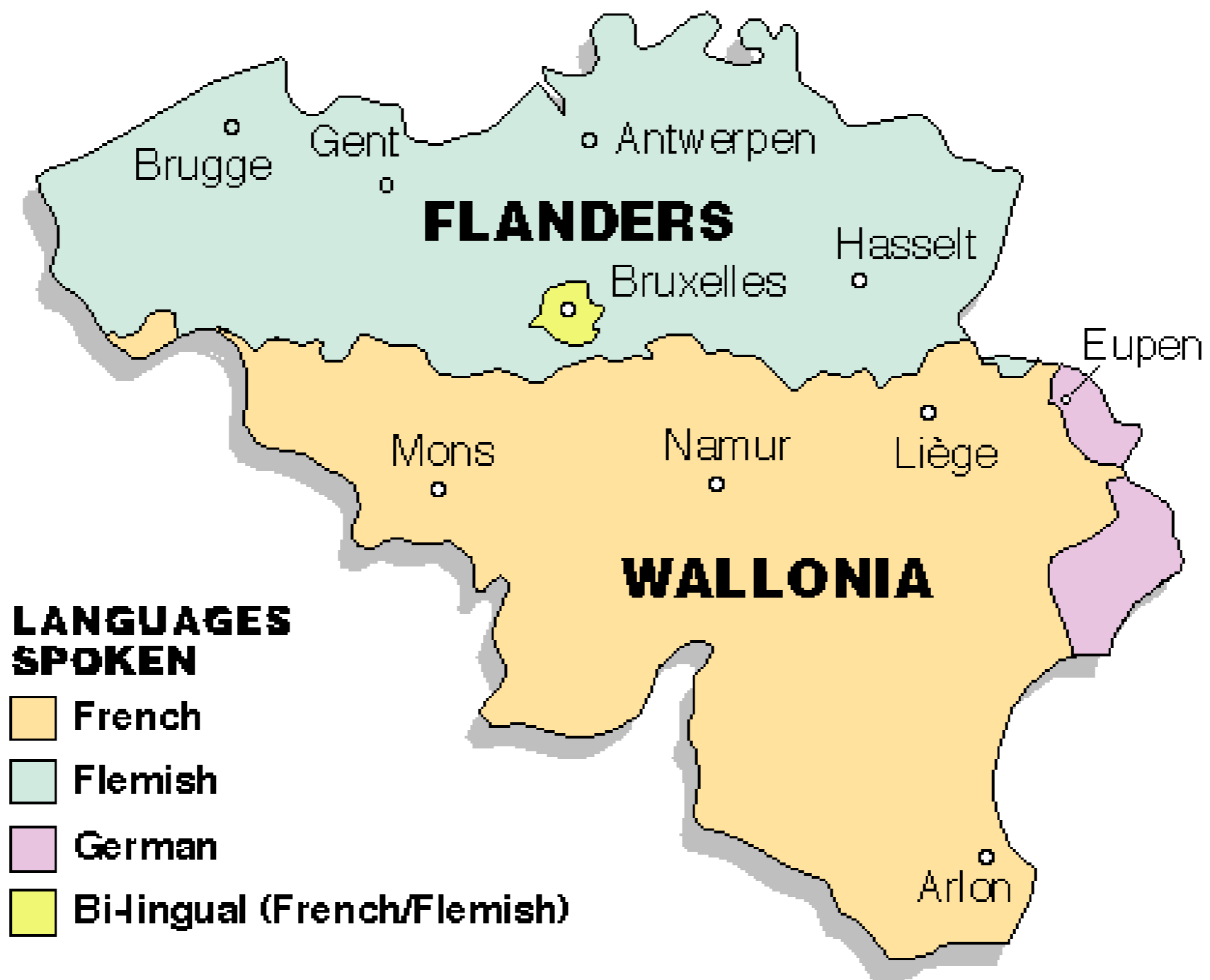
Monterey

CALIFORNIA

Visalia

San Luis Obispo

Bakersfield



two ways to become a teacher in Flanders

general and vocational secondary education (until 18)



professional bachelor in teaching (2 subjects)

- university college
- focus on (re-)learning content and teaching methods
- qualified to teach in grades 1-4

3 years



academic bachelor + master

- university
- specific subject
- focus on academic research

3 + 2 years



specific teacher training

- university
- focus on teaching methods
- qualified to teach in grades 3-6

1 year

The **curriculum** in Flanders

broad attainment goals for each subject, set by the government

- controlled by school inspection (once every 4 years)
- no central exams

history curriculum

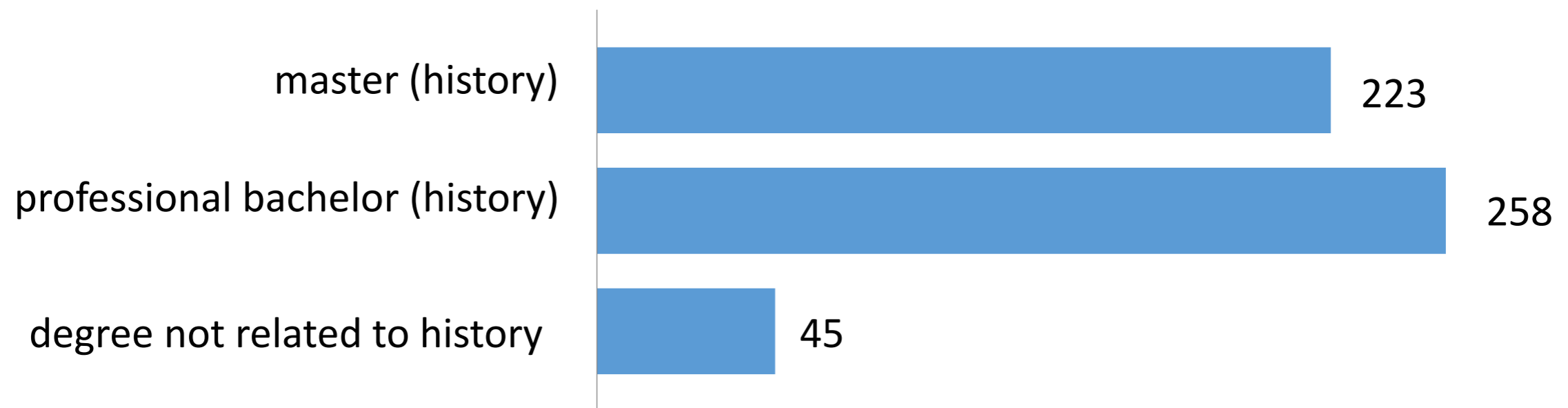
“one of the goals of secondary education is to **develop students’ competence in applying domain-specific research methods**. With regard to history, students must learn how to form research questions, evaluate interpretations by others, and form their own claims. To this end, they must be able to find, select, analyze, compare, and evaluate historical sources.

As such, students in secondary education should be familiarized with historical inquiry methods **as soon as possible.**”

The curriculum **in practice**

Survey with representative history teacher sample *(Voet & De Wever, in press)*

- 516 teachers, divided over 219 secondary schools
- average of 13 years of experience with history teaching (SD=10)
- distribution of degrees in line with general teacher population



- name not required and returned in sealed envelope

a student who excels in history is one who...

	N	%
knows the chronology, facts and central concepts of history, and is able to relate different chapters of the textbook to one another.	187	36.45
demonstrates a balanced development of knowledge and skills, and is able to think critically about information.	212	41.33
is able to tackle new contents, which means: answering a research question based on an analysis of information sources, drawing on theory and facts from the history lessons.	114	22.22

historical sources...

	N	%
are an extra to the lesson, to help students imagine a situation, or to make an idea more clear. Students regularly need illustrations and examples to understand everything.	135	26.32
help to work on skills and present important knowledge. Their use by students requires a highly structured approach: teachers have to ask questions, provide guidance, and guard progress, so that no lesson time is lost.	263	51.27
have to be extensively and critically analyzed, by letting students search, discuss, ask questions and take different points of view. It is self-evident that this takes up a lot of time.	115	22.41

Flanders is **not the only one in this situation**

- **National Council of Social Studies** C3 Framework
"Inquiry is at the heart of social studies."
- **California** history-social science content standards
"Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations"

and yet...

history instruction in the US typically embraces memorization of facts rather than investigation *(Monte-Sano, 2011, Van Hover, Hicks, & Cotton, 2012)*



SO WHAT DO WE DO NOW?

why do some teachers organize inquiries, whereas others don't?

This question is about teachers' **instructional decision-making**

prior to the lesson (blueprint)

- quite a lot of time to make decisions
- often well-considered

during the lesson (tweaks)

- generally in response to unanticipated events
- little room to consider alternatives

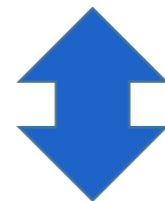
How do teachers make decisions **during lesson preparation**?



Hypothesis 1: **a matter of knowledge**

- content knowledge (**CK**): how to investigate the past?
- pedagogical knowledge (**PK**): how to organize inquiries in class?

Some evidence that teachers' knowledge determines their use of inquiry
(e.g., Bouhon, 2010; McCrum, 2013)



But also case studies on knowledgeable teachers not using inquiry
(e.g., McDiarmid, 1994; VanSledright, 1996; Hartzler-Miller, 2001)

So which of the two is it?

Hypothesis 1: **a matter of knowledge**

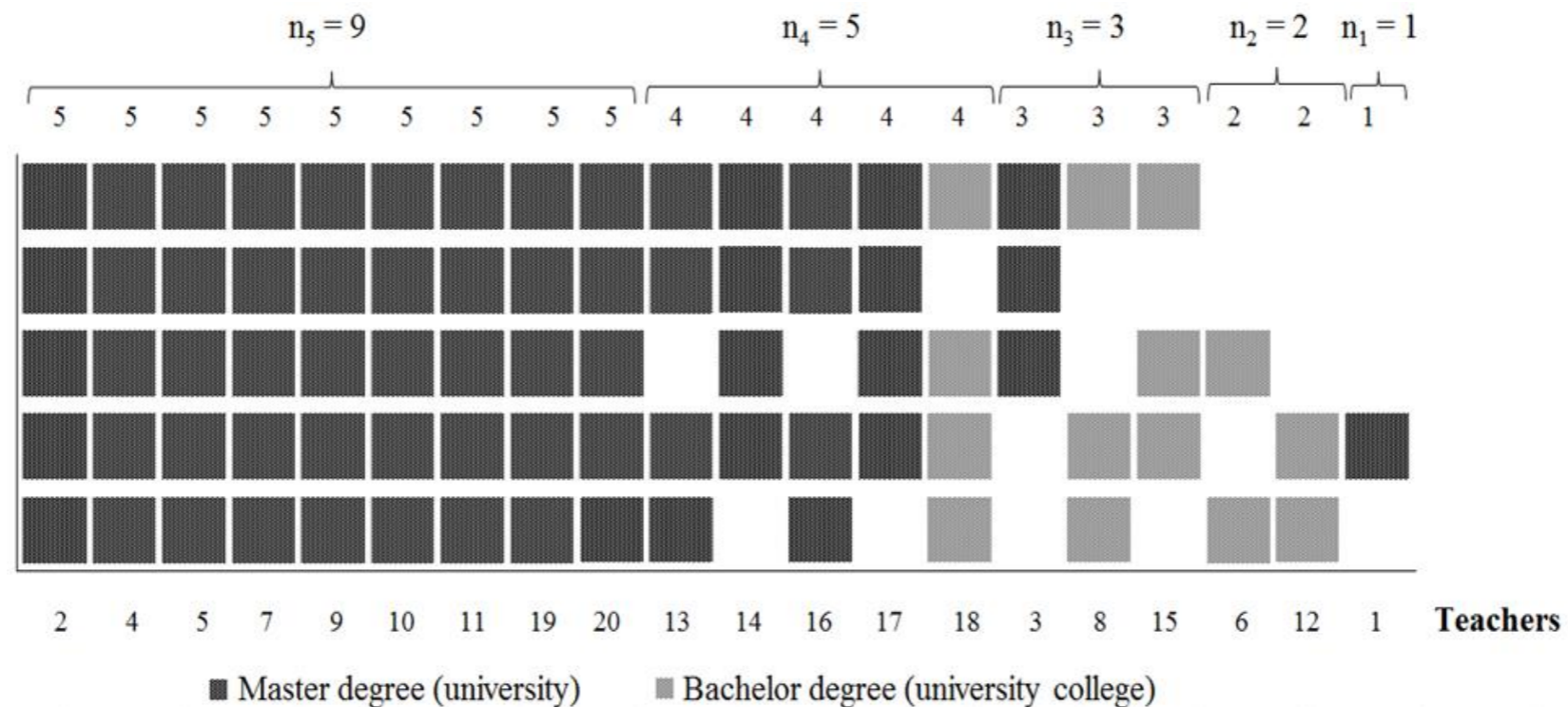
interview and think-aloud task with 19 history teachers

interview

how do you use historical sources in the classroom?

think-aloud task

is the "Peasants' Revolt" a fitting name for the English revolt in 1381?



Hypothesis 1: a matter of knowledge



use of sources in class

inquiry

brief source analyses

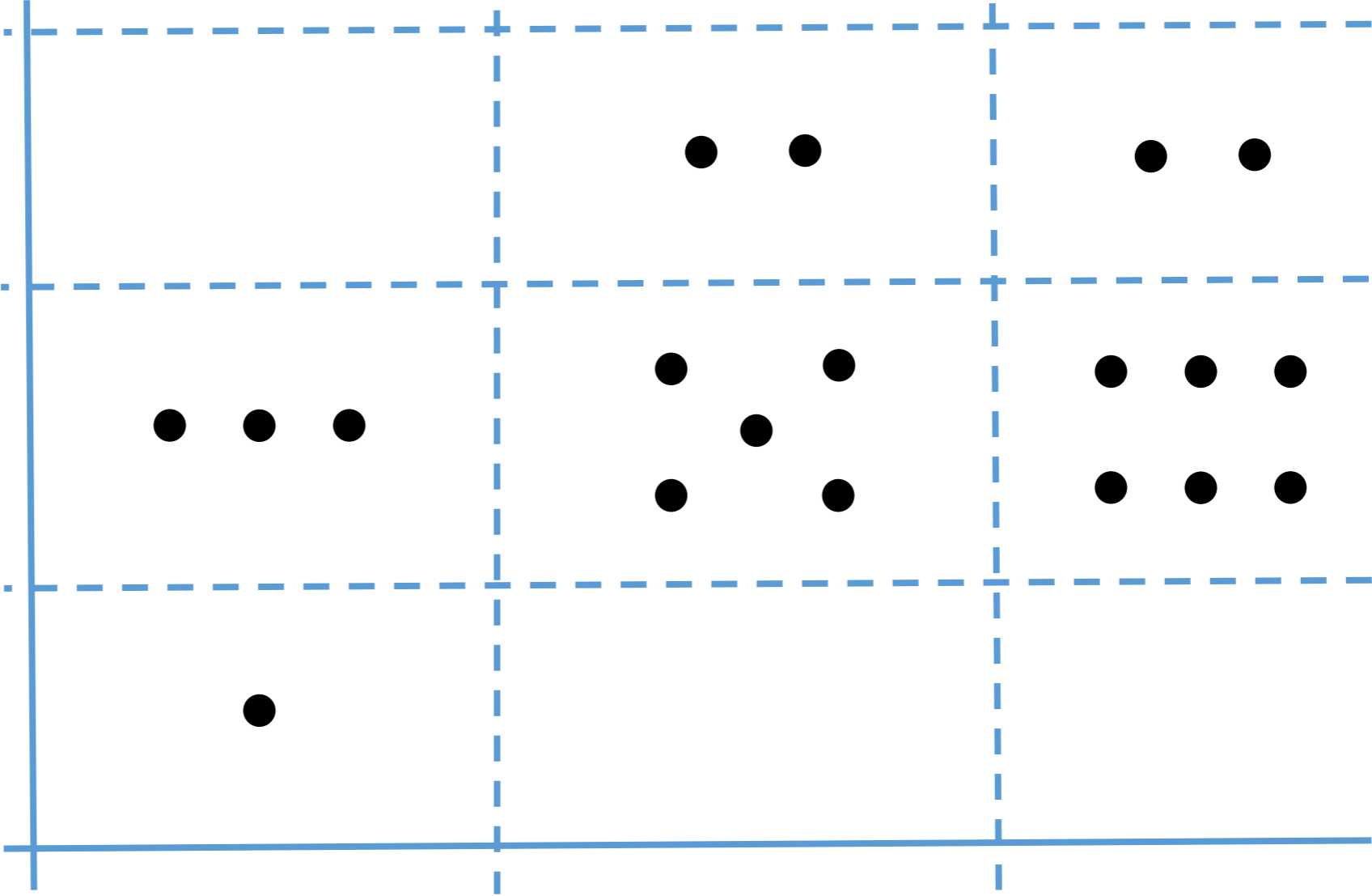
sources as illustration

unsuccessful

partly successful

successful

inquiry task performance



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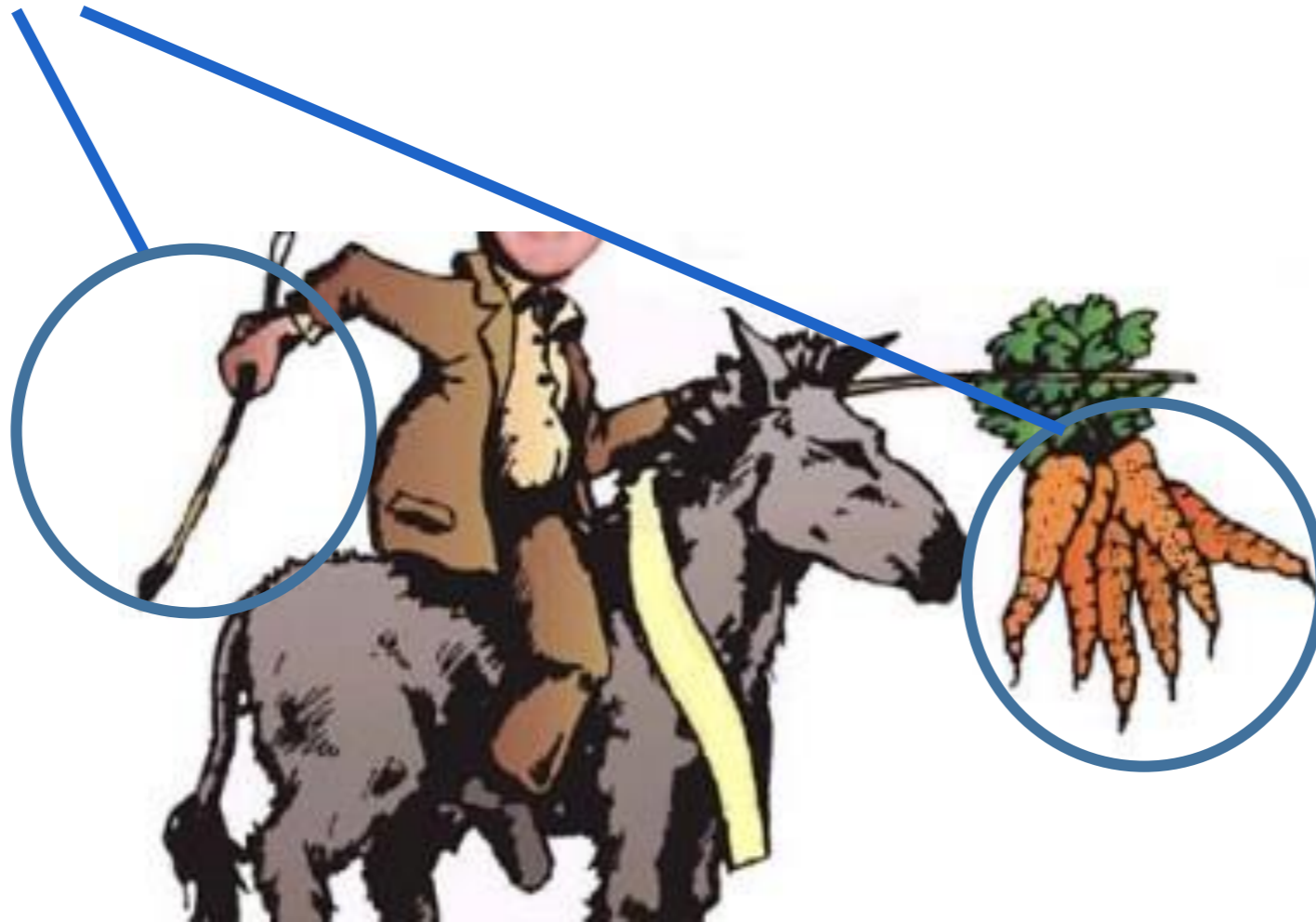
So which of the two is it?

Knowledge appears to be a **prerequisite**, rather than a **guarantee**

Hypothesis 2: **a matter of incentives** *(Dalkir, 2005)*

external incentives:

- material (e.g., money) or social (e.g., belonging)



external incentives arguably play a limited role

Hypothesis 2: **a matter of incentives** *(Dalkir, 2005)*

internal incentives:

- Personal feelings and ideas (e.g., convictions, motivation)



Several reviews indicating that behavior is often consistent with **beliefs**

(e.g., Fang, 1996; Kagan, 1992; Pajares 1992)

beliefs are ideas formed throughout teaching, and are...

(Borg, 2001; Rokeach, 1968)

personal

- no consensus (contrary to knowledge)
- commonly based on experience and anecdotes

evaluative

- generally hold some kind of judgement
- framework for evaluating new information

durable

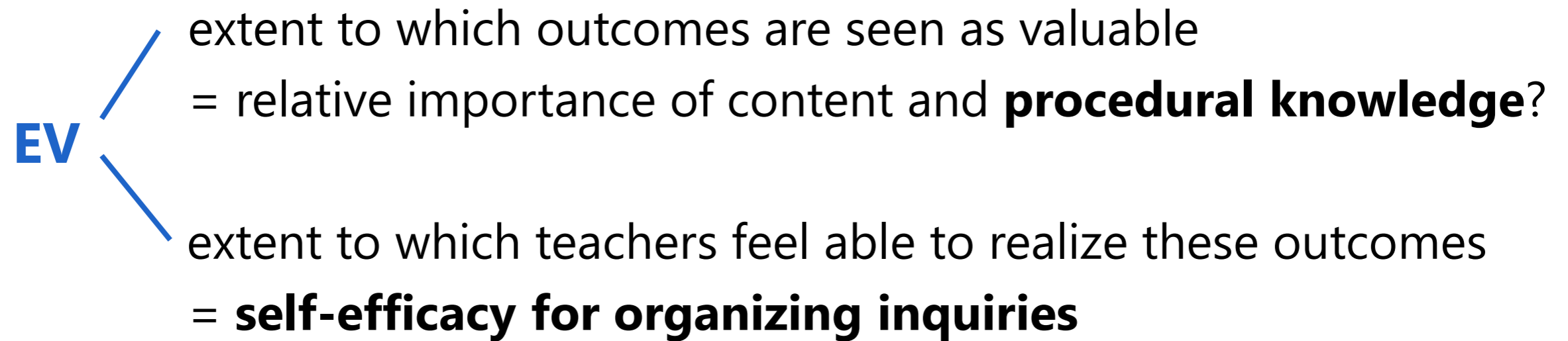
- develop into an integrated system
- become increasingly resistant to change

often unconscious

- can be retrieved through prompts and reflection

which beliefs about education matter most in decision-making?

adoption mainly depends on **expected value (EV)** (Pollock, 2006)



...but sometimes overridden by the **teaching context** (Fang, 2001)

- student level
- time
- curriculum materials
- ...

Same **survey** as before, 536 history teachers (*Voet & De Wever, in press*)

constructs measured through Likert scales

How important do you think the following goals of school history are, for the grade and study track in which you teach history most frequently? For each goal, check the answer that is closest to your opinion.

1	2	3	4	5	6
<u>Very</u> <u>unimportant</u>	<u>Unimportant</u>	<u>Rather unimportant</u> <u>than important</u>	<u>Rather important</u> <u>than unimportant</u>	Important	<u>Very</u> <u>important</u>

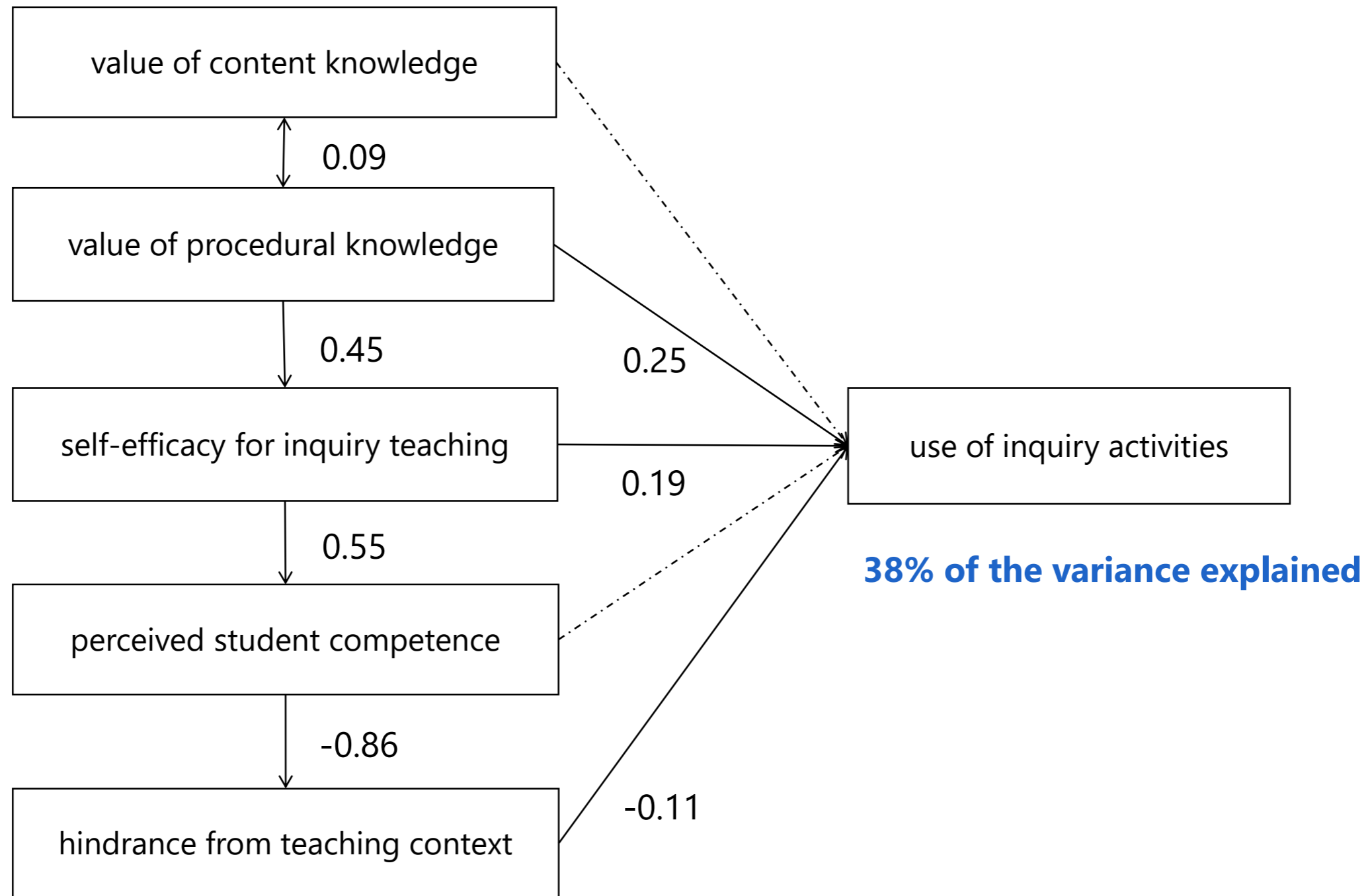
OTS1. Building a historical framework for situating events and phenomena.

OTS2. Gaining insight into the most important characteristics of different time periods.

OTS3. Developing a basic knowledge of turning points in the distant and more recent past.

scale validation through EFA-CFA, then SEM (good fit: CFI=.96, TLI=.95, RMSEA= .03 [.03; .04], SRMR=.05)

structural equation model (SEM) for **use of inquiry activities**



other paths to explore?

human behavior is not 100% rational, but still about 60% left

- pleasure (affective)
- social pressure (extern)
- ...

findings holds **consequences for effective training:**

- focus not only on knowledge
- ...but also **changing beliefs about expected value**

DESIGNING TRAINING

1. knowledge

- content knowledge (**CK**)
- ...then pedagogical knowledge (**PK**)

2. beliefs

often rather conservative

apprenticeship of observation (*Bandura, 1971; Lortie, 1975*)

- humans learn a lot from observation (=safe)
- countless hours of observing history teacher lectures

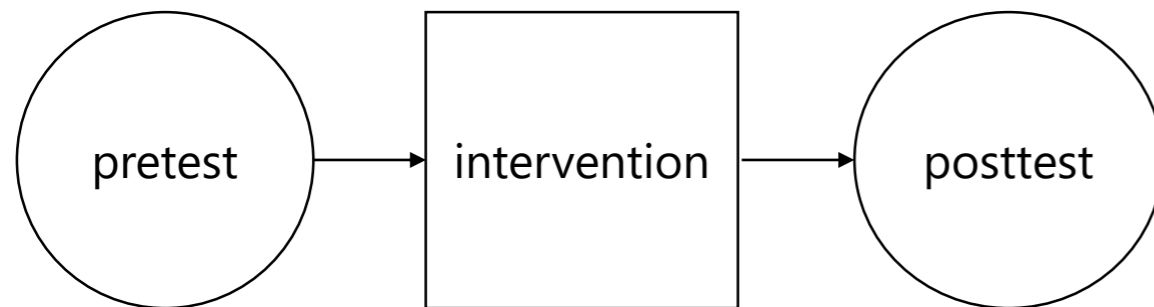
is teacher education able to make a difference? (*Zeichner, & Tabachnick, 1981*)

- teacher training results in superficial beliefs changes at best
- VS.**
- teacher training can affect beliefs, but new beliefs are fragile

STEP 1: content knowledge?

teach as you preach, to provide new models (*McDermott, 1990; 2006*)

intervention with **302 student-teachers** (bachelor) (*Voet & De Wever, in press*)



- inquiry instead of lecture
- authentic inquiry
- 4 hours
- support through Web-based Inquiry Science Environment (WISE)

(*Linn, Clark, & Slotta, 2003*)

A quick look at the **inquiry environment**

WISE v4 Full Screen My Work Flagged Home / Sign Out

Onderzoek naar het verleden: De Engelse boerenopstand

Welcome Test User!
Expand All Collapse

1: Inleiding

- stap: 1.1 Inleiding
- stap: 1.2 Achtergrondinformatie
- stap: 1.3 Onderzoeksaanpak
- stap: 1.4 Onderzoeksvragen

2: Informatiebron 1 +

3: Informatiebron 2 +

4: Informatiebron 3 +

5: Informatiebron 4 +

6: Informatiebron 5 +

7: Conclusie +

De Engelse boerenopstand



De opstandelingen, door hedendaagse fotograaf Red Saunders (Bron: tentoonstelling 'Hidden').

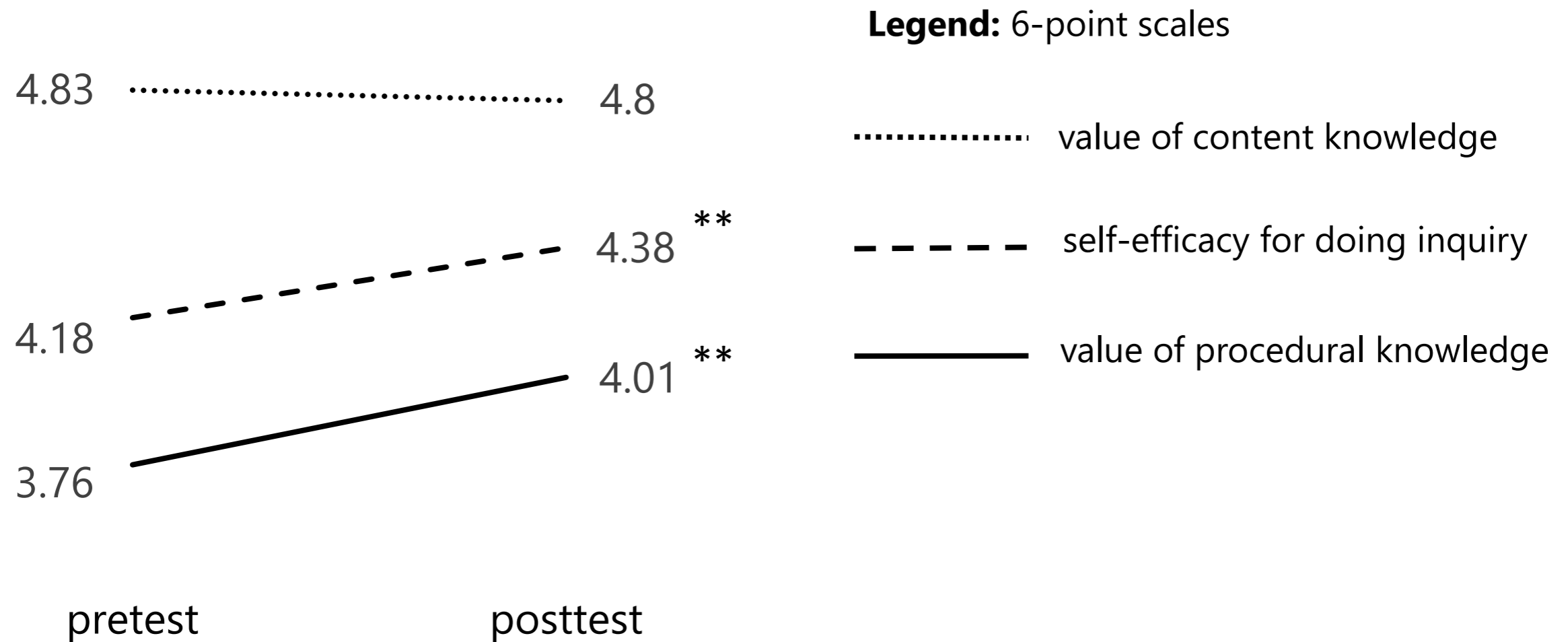
Opstand in het middeleeuwse Engeland

Donderdag **30 mei 1381** is de geschiedenisboeken ingegaan als de dag waarop er een **opstand in Engeland** uitbrak, die uiteindelijk heel het **zuidoosten van het land** in rep en roer zette. Na een aantal bloedige schermutselingen op het platteland, trokken de opstandelingen naar de hoofdstad Londen. Daar aangekomen, vroegen ze om de koning te zien om hun eisen aan hem voor te leggen.

Op 15 juni van dat jaar had koning **Richard II** een ontmoeting met de leiders van de opstandelingen. Volgens de overlevering beledigde een van de leiders, **Wat Tyler**, de koning, en brak er geweld uit tijdens de onderhandelingen. Tyler werd gedood en de koning liet de andere leiders vasthouden, zodat de burgemeester van Londen in de stad soldaten kon verzamelen om de ontredderde opstandelingen uiteen te drijven.



results show **positive general effects**



students' reactions about their experience help to explain effects

self-efficacy for doing inquiry

“Reading different sources has showed me that historical inquiry is not simply based on facts. Historians interpret sources in their own way, and no source is completely without bias.

“At first I thought that interpretation did not really have a place in historical inquiry. Now I realize that a source almost never provides a direct answer to your question, and that you can interpret sources in different ways.”

importance of procedural knowledge

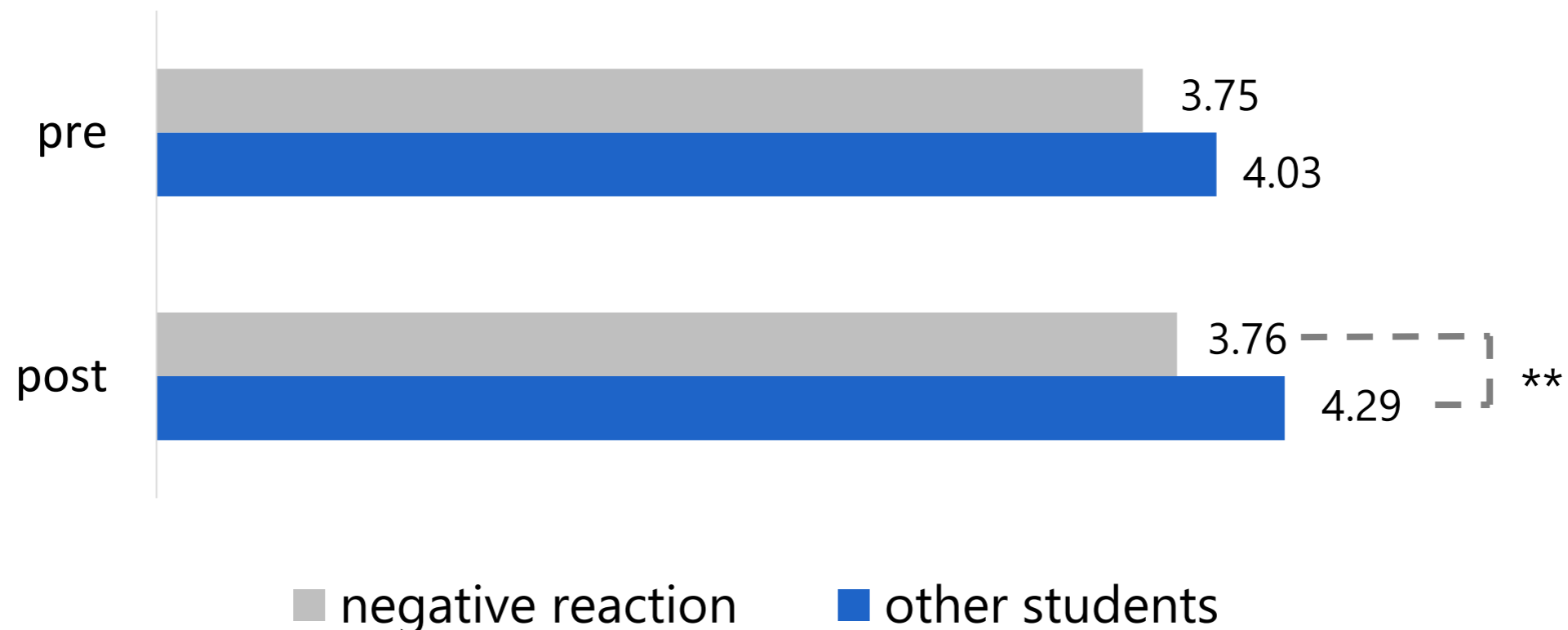
“Now I understand why our professor always encourages us to use sources in our classes.”

“Students should be allowed to form their own claims or opinions. It is not a bad idea to teach them how to conduct their own inquiries.”

but does a general positive effect mean it's the **same for everyone?**

25 student-teachers (8%) note at the intervention that they're still not convinced of the value of inquiry learning

second look at importance of procedural knowledge:



student-teachers who were initially the least convinced about value of procedural knowledge, appear to be rather **resistant to new model**

is it **possible to change these students' ideas?**

do they need **more of the same?**

...or **clarification and reflection?**

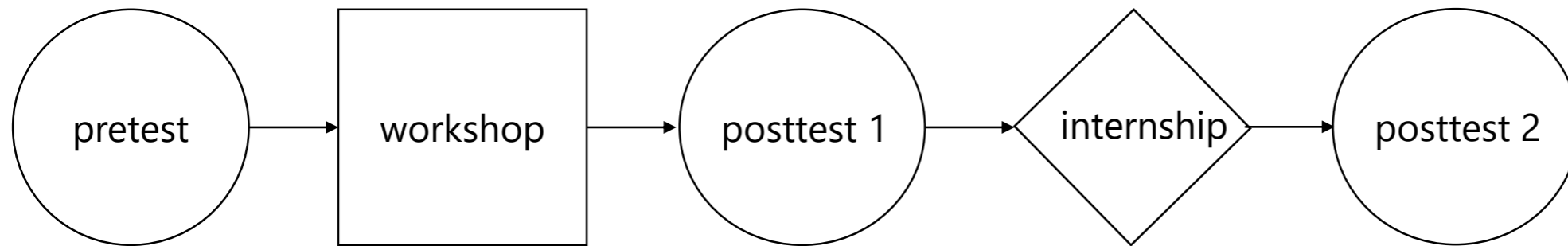
- rationale behind inquiry learning
- benefits compared to other approaches?

also, **how durable is the general positive effect?**

if real change occurred, new beliefs are very fragile

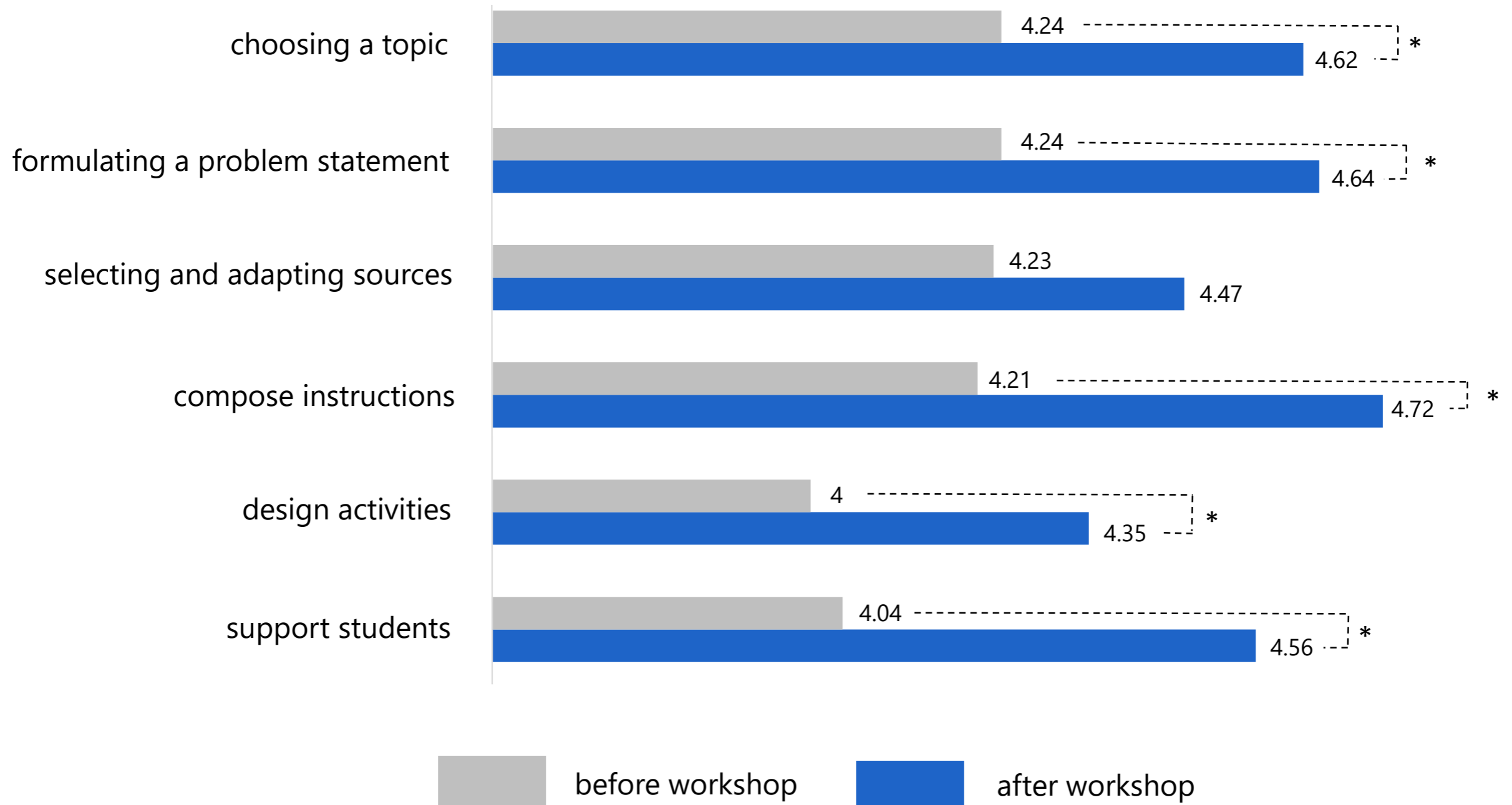
STEP 2: **pedagogical knowledge**

intervention with **54 student teachers** (bachelor & master) *(Voet & De Wever, 2017)*

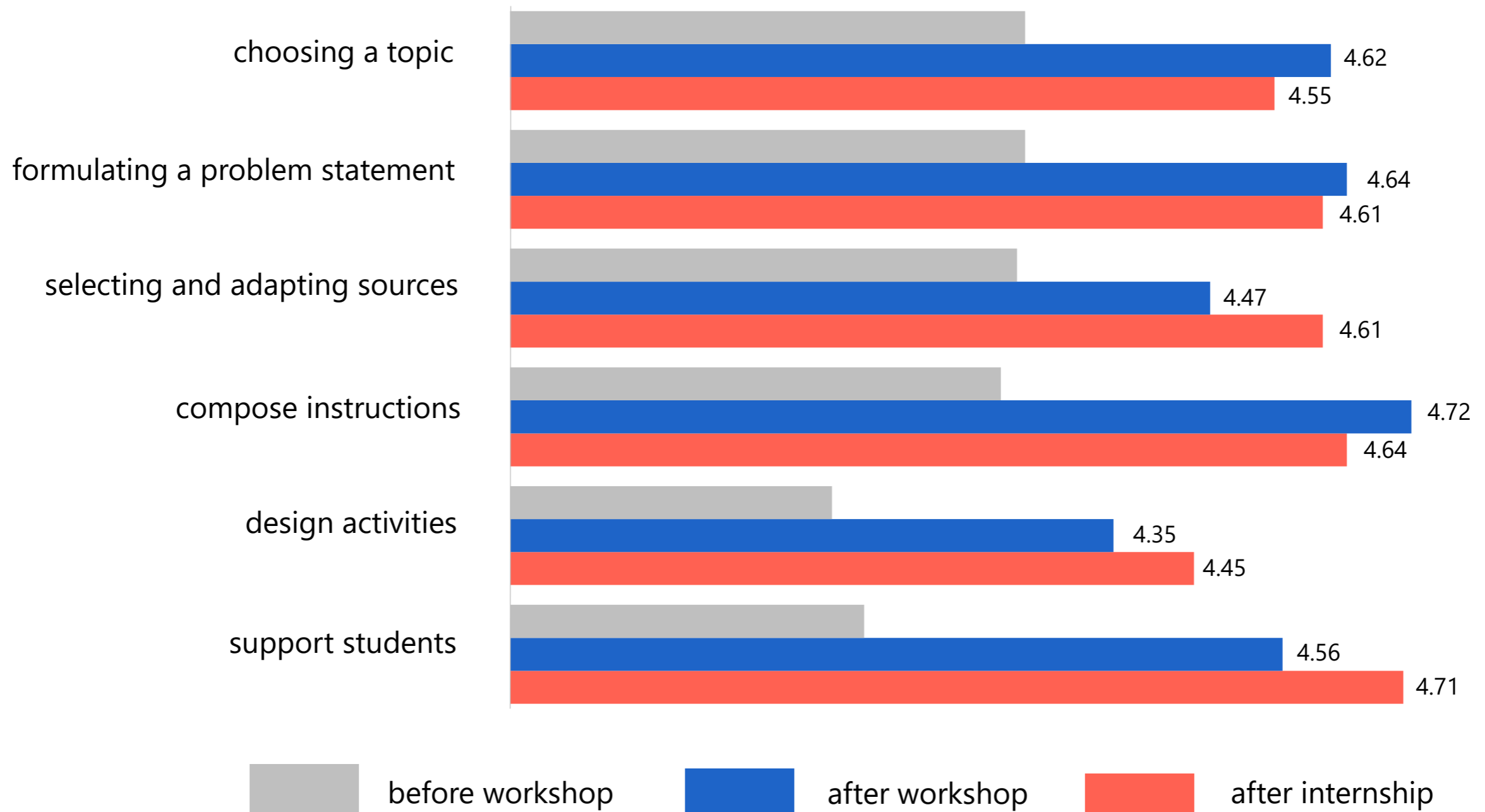


- **4h workshop** on how to organize IL
- after workshop: **organizing an inquiry** (min. 1 lesson) during internship
- reflection papers about preparation and execution of lesson
- lesson plans
- interview at end of semester

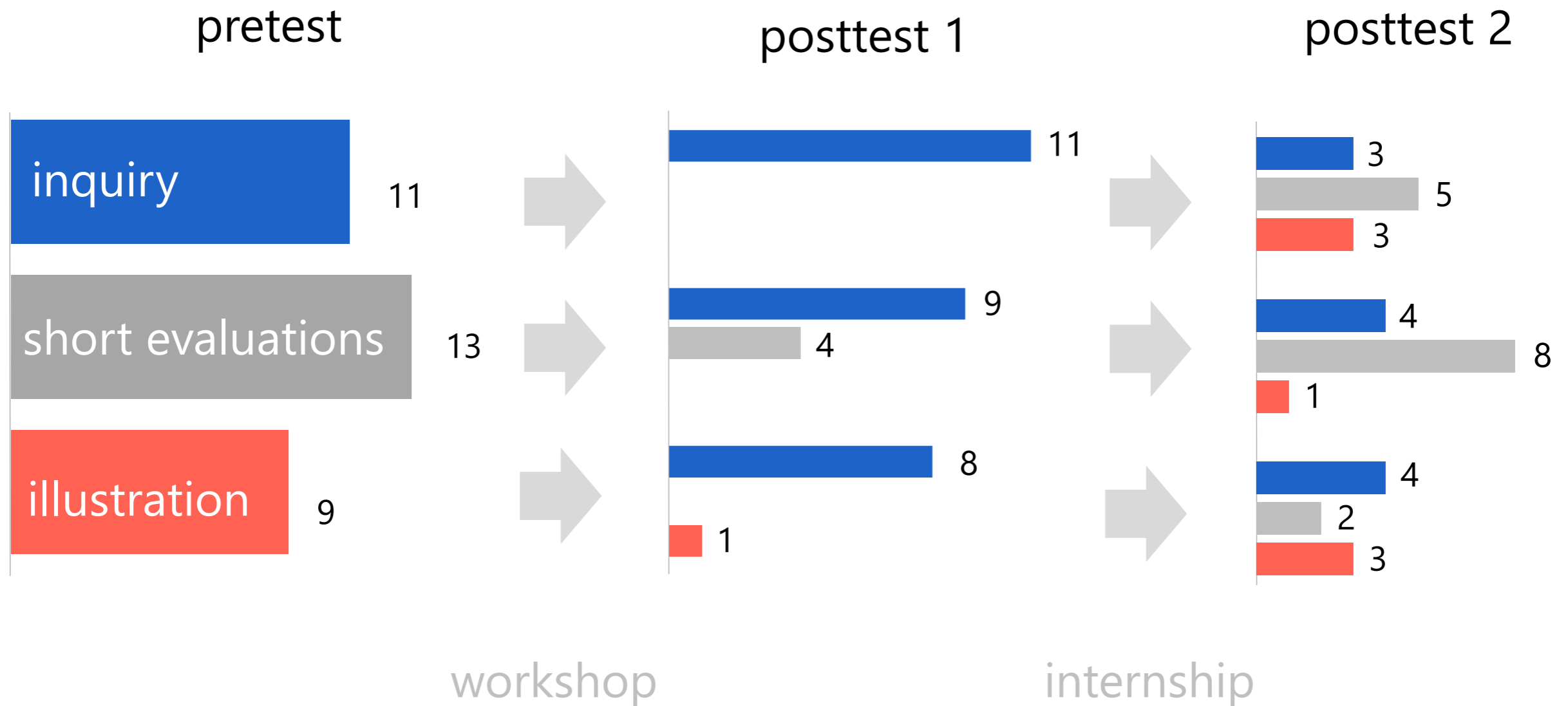
self-efficacy before and after workshop (6-point Likert scale)



self-efficacy after internship (6-point scale)



ideas about sources, before and after the workshop ...and after internship



Most students **change beliefs twice!**

lesson plans?

Vergelijk bovenstaande interviews en vul onderstaande tekst aan.

In interview 1 toont dokter Turner dat hij kinderarbeid is. Welke argumenten geeft hij hiervoor?

.....
.....
.....
.....

In het tweede interview is dokter Ward duidelijk kinderarbeid. Wat zijn zijn belangrijkste argumenten?

.....

Beide interviews werden in 1819 afgenomen in het Britse parlement en werden voorafgegaan door een onderzoekscommissie zoals in het filmfragment uit Daens. De historicus Gijs De Boeck toont aan dat kinderarbeid in België pas veel later op de politieke agenda komt. In wordt

kinderarbeid verboden. Nochtans blijft kinderarbeid in de praktijk veel langer bestaan.

"Afhankelijk van de wetgeving op



Compare the interviews above and complete the following text.

In interview 1, doctor Turner shows that he is child labor. Which arguments does he provide?

.....

In the second interview, doctor Ward is clearly child labor. What are his most important arguments?

Both interviews were taken in 1819 in British Parliament and were preceded by a Committee of Inquiry, as in the fragment from the movie 'Daens'. Historian Gijs De Boeck has shown that it took much longer for child labor to make the political agenda in Belgium. In, child labor is no longer allowed. Yet, in reality, child labor stayed around much longer.

fill in the blanks

narrow question(s), knowledge telling

lesson plans?

ONDERZOEKSOPDRACHT

Centrale onderzoeksvraag : **Hoe zag de Khmer-beschaving eruit?**

Een reconstructie aan de hand van het reisverslag van Zhou Daguan en de archeologische reliëfscènes in Angkor. (zie bronnenbundel)

Deelvraag A: **Hoe aten de Khmer?**

.....

.....

.....

.....

.....

.....

.....

.....

.....

INQUIRY ASSIGNMENT

Central research question: **What did the Khmer society look like?**

A reconstruction based on Zhou Daguan's [a Chinese diplomat] report of his journey and scenes from archeological reliefs in Angkor (see your sources booklet)

Sub-question A: **How did the Khmer eat?**

summary

open question, knowledge telling

lesson plans?

VERSLAG

"wat waren de twee meest doorslaggevende motivaties van de kruisvaarders?"

Dit is een eigen inschatting en kan dus bij iedereen anders zijn. Let er op dat de deelnemers aan de kruistochten heel divers waren. Hou daar rekening mee. Verder:

- Onderbouw je je eigen mening. Je legt dus uit waarom je iets denkt.
- Je vermeldt steeds vanwaar je de aangehaalde informatie hebt gehaald en hoe betrouwbaar die is.
- Denk ook reeds na over tegenargumenten die een ander zou kunnen geven. Probeer die in je tekst te weerleggen.

REPORT

"Which were the two main motives for the Crusades?"

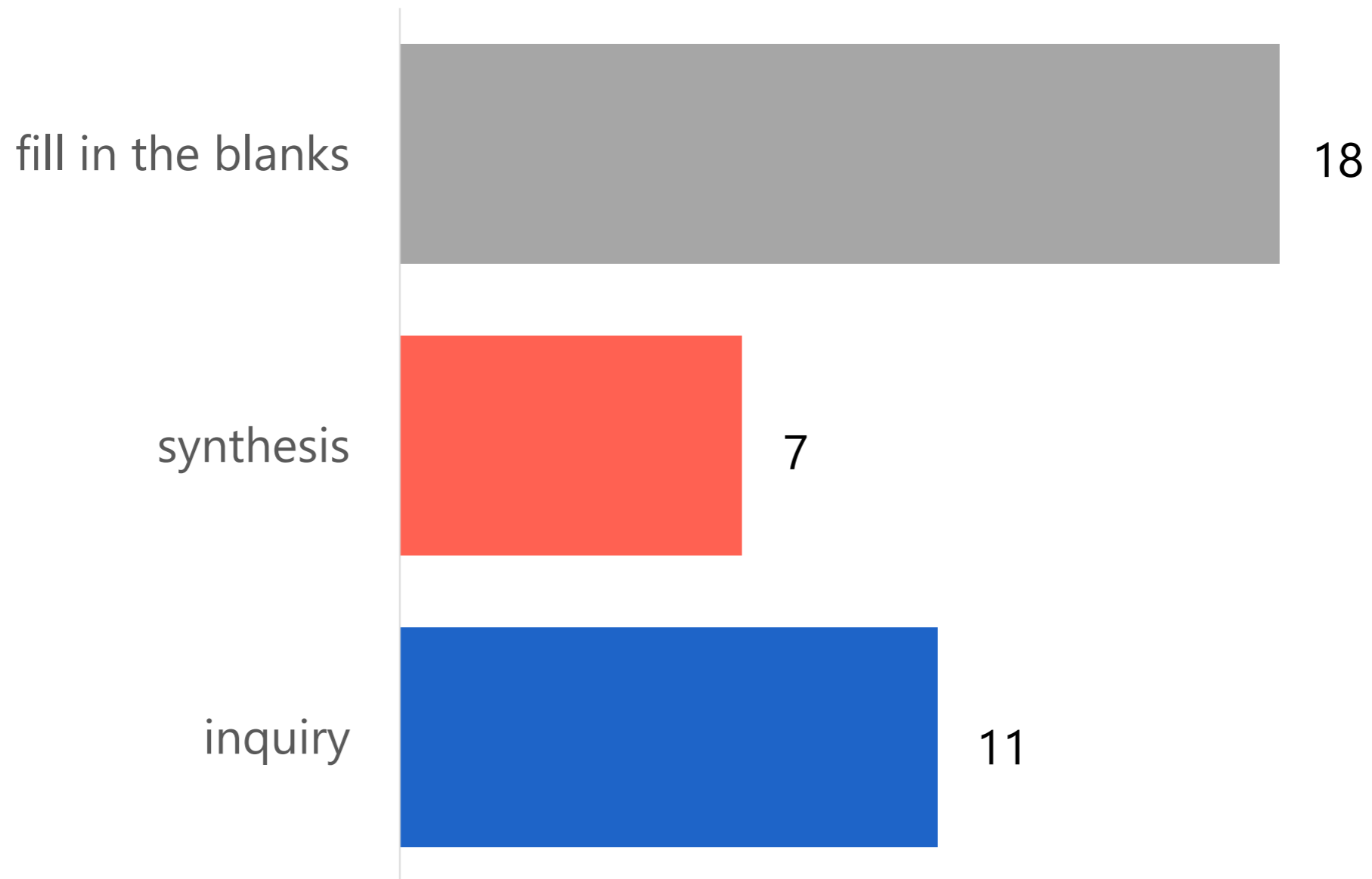
This is your personal conclusion, and it can therefore vary from that of others. Keep in mind that a variety of people participated in the crusades. Also:

- Use evidence to support your interpretation
- Note where you got the evidence and how reliable you think it is
- Think about possible counterarguments that others might give. Try to rebut those in your text.

inquiry

open question, knowledge transformation

lesson plans?



a lot of variance in lesson plans, similar to beliefs

students' experiences

positive experience for most students

"The first class where I had to do the inquiry was known as one of the toughest crowds in school, with little respect for the teacher, and students that often did not collaborate well. But it became one of the rare lessons during which students were really engaged with the content, and were not constantly interrupting"

"It allows you to interact with the students in a more personal way, and discover problems with their understanding of the content more quickly."

some difficulties with **adjusting to new role**

"I focused all my attention on the students who were asking a lot of questions. Looking back, I started realizing that those were actually the students who were already doing a good job."

combination of **workload**...

“You not only have to find a set of sources that students can understand and use to answer the problem statement, but you also have to think about practical organization, make source booklets, and write out instructions.

“It is really an approach that takes up a lot of time: prior to the lesson (preparation), during the lesson (spending a lot of time on something that you yourself could explain more quickly, and after the lesson (going through students' work).

... and **internship context**

“My mentor gave me all of the topics in advance, and they expect you to cover all of those during the internship. In that sense, it was hard to organize an inquiry on a specific topic.

“My students still require a lot of training for just being able to give accurate descriptions of what they find in historical sources. Making their . Zelf evaluaties maken is nog niet aan de orde.”

SO WHAT HAVE WE LEARNED?

In a nutshell

training for IL should focus not only on knowledge, but also on **beliefs**

...**and** training appears able to actually change (most students') beliefs

...**but**, practice seems to lead to further (often undesired) change

...**so**, need for **extended support** and more **longitudinal research**

QUESTIONS?

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