



Spreading interest in particle physics among high-school students – what matters?



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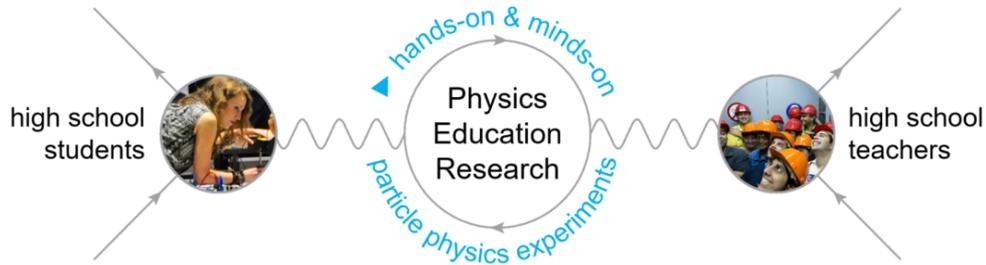
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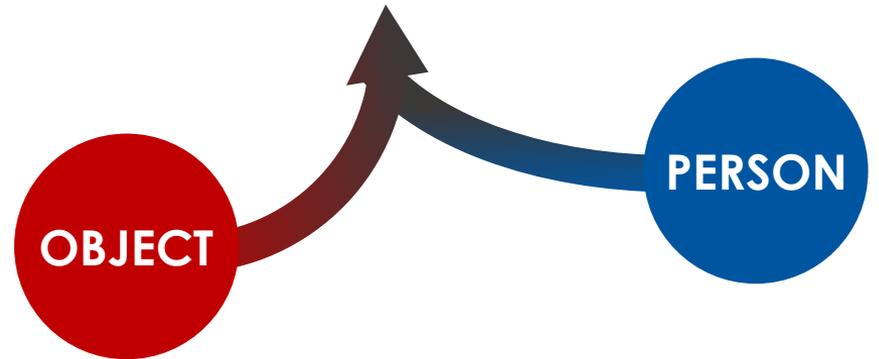
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Why spreading interest?

Interest ...

- is a specific **relationship** between a person and an object.
- enhances **persistence** when engaging with the object of interest.
- is **crucial for course** and **career choices**.



Object of interest

Previous studies focused on interesting

- **contents** (e.g. X-ray)
- **contexts** (e.g. medicine)
- **tasks** (e.g. conduct an experiment)
- **learning environments**
(e.g. student laboratory)



OBJECT

Interest in physics



“... most studies report a positive effect of context-based science education on students’ interest ...” (Habig et al., 2018)



Interest in physics

Previous studies distinguish between **2 types of interest:**

- 1. Generally and highly interested**
- 2. Highly interested in relation to nature and humans, applications and relevance for society**

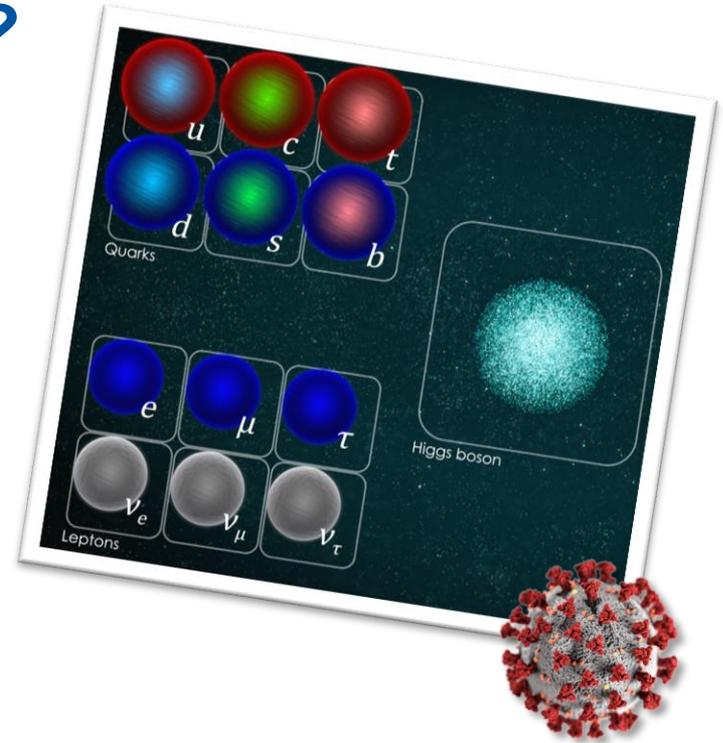


Particle physics

A superspreader of interest?

Particle physics contents might be **equally** and **highly interesting** for all types of students

⇒ **BUT:** not included in previous empirical studies

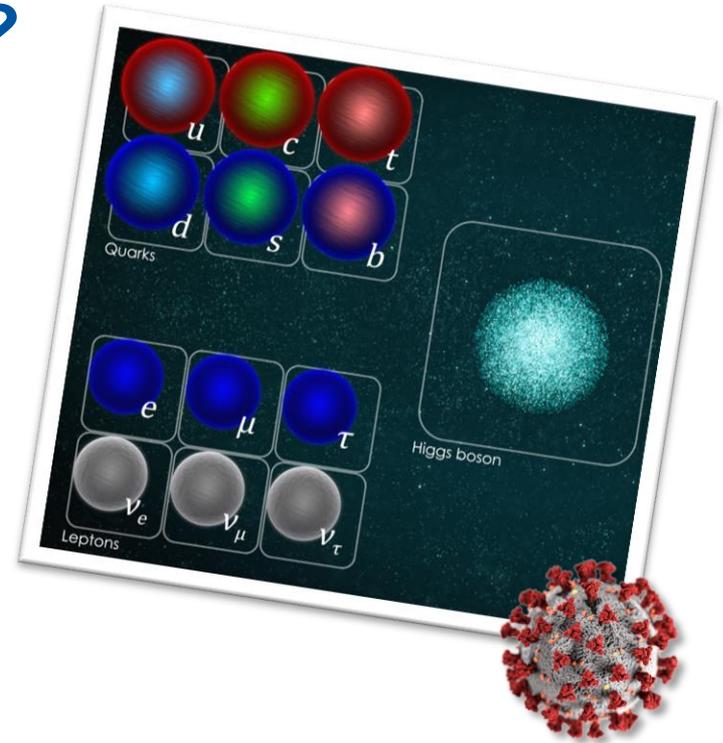


Particle physics

A superspreader of interest?

⇒ Empirical study: *How interesting are **particle physics contents**?*

- **Online questionnaire**
- **Data sample:** 99 students, German-speaking, 9th grade



Questionnaire

How interested are you in doing the following?

My interest in it is ...

very high

high

medium

low

very low

Learning more about how a
particle accelerator works



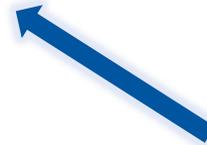
Exemplary item categories

Item category	Exemplary item
Learning more about the function principle of technical devices	Learning more about how a particle accelerator works
Learning more about qualitative physics	Learning more about which interaction binds together the elementary particles in the nucleus space
Constructing technical devices	Building a particle detector out of daily life objects



Result

Students cannot be categorised into types of interest in particle physics



Discussion

- 1) Scale **oversaturated**
- 2) Biased **sampling population**
- 3) Particle physics is **equally** and **highly interesting** for all students



Spreading interest in particle physics

What matters?

- 1) How to treat **diseases** using particle accelerators
 - 2) How particle physics contributes to a better understanding of the **big bang**
 - 3) How to **detect** smuggled **weapons** in a container using particle detectors
 - 4) How to study the inside of **vulcanoes or pyramids** using particle detectors
- ⇒ Relation to **humans and nature, applications and societal relevance**



Thank you very much for your attention!

Looking forward to your questions!



References

1. Habig, S., Blankenburg, J., van Vorst, H., Fechner, S., Parchmann, I., & Sumfleth, E. (2018). Context characteristics and their effects on students' situational interest in chemistry. *International Journal of Science Education*, 40(10), 1154-1175. doi:10.1080/09500693.2018.1470349
2. Häußler, P., Lehrke, M., & Hoffmann, L. (1998). *Die IPN-Interessenstudie Physik*. Kiel: IPN.
3. Krapp, A. (2002). Structural and dynamic aspects of interest development: theoretical considerations from an ontogenetic perspective. *Learning and Instruction*, 12, 409. doi:10.1016/S0959-4752(01)00011-1
4. Sievers, K. (1999). *Struktur und Veränderung von Physikinteressen bei Jugendlichen*. (Doctoral), Universität Kiel, Kiel.



Backup slides

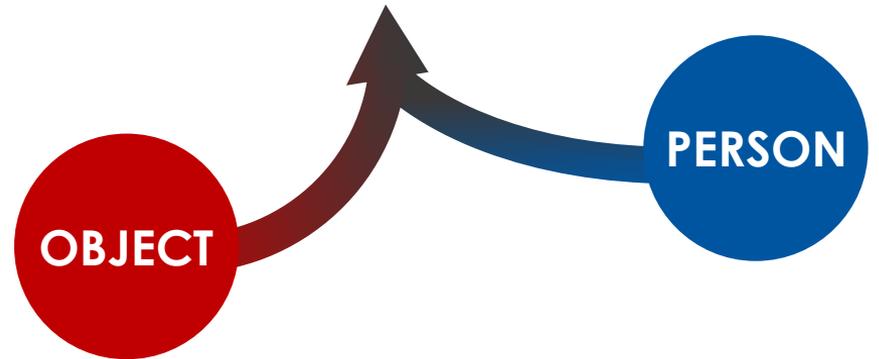
Just in case ...



What is interest?

Interest involves ...

- the wish to **learn more**,
- positive or negative **emotions**, and
- personal **value**.



Interest and self-concept

What is physics-related self-concept?

⇒ Confidence of a student to be **successful in physics**



Analysis of the study

Mixed-Rasch model:



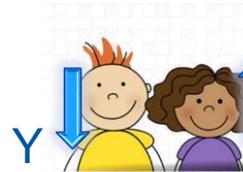
1. *Latent class analysis*: latent, **qualitative** person variable, according to which persons are sorted into classes

⇒ **Type of interest**



2. *Rasch analysis*: individual **quantitative** parameter within each class

⇒ **Degree of interest**

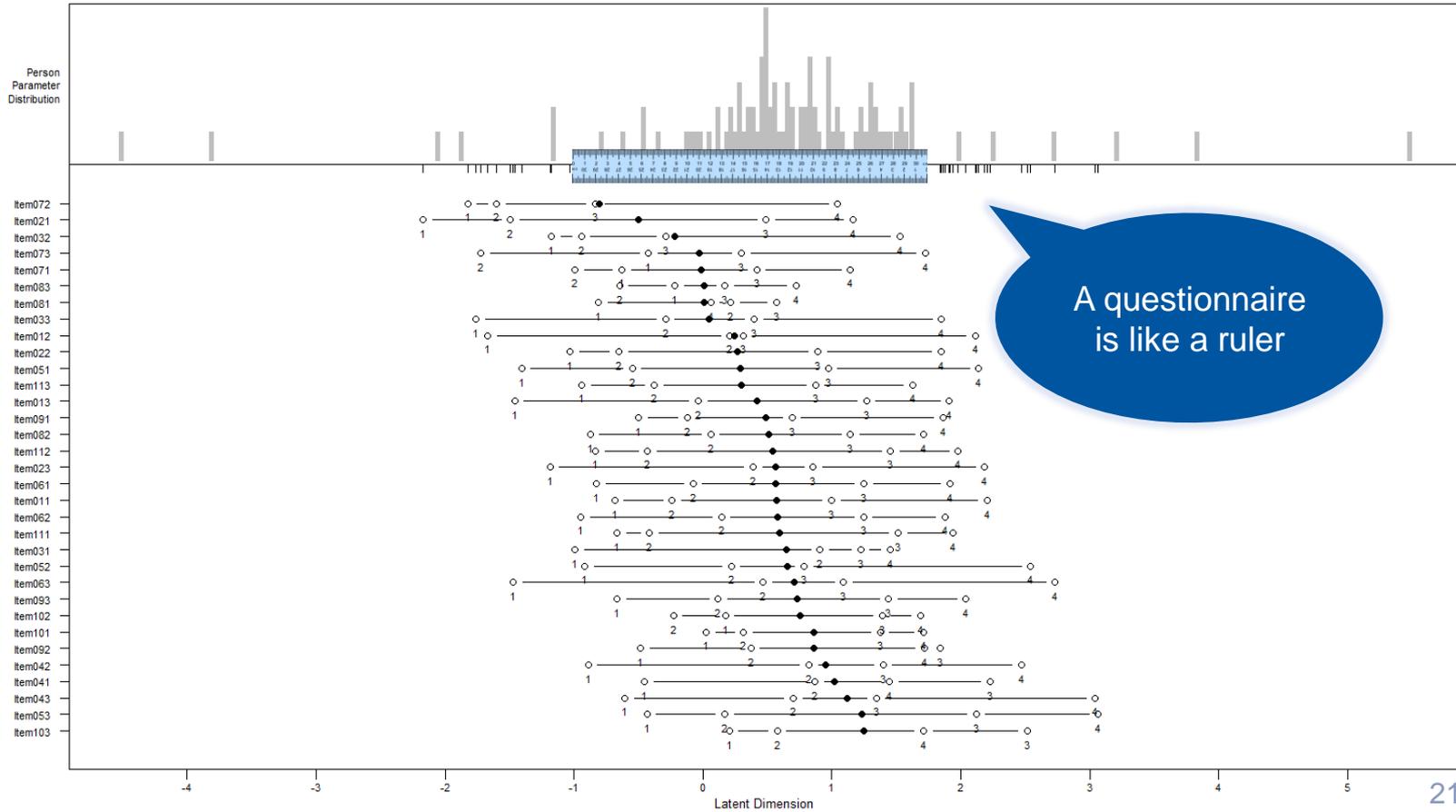


11 item categories

#	Description
1	Learn more about the function principle of technical devices
2	Learn more about natural phenomena
3	Learn more about the relevance of physics for society
4	Learn more about qualitative physics
5	Learn more about quantitative physics
6	Get insight into technical jobs
7	Get insight into jobs related to humans
8	Construct technical devices
9	Plan experiments
10	Calculate physical quantities
11	Discuss about the societal relevance of physics



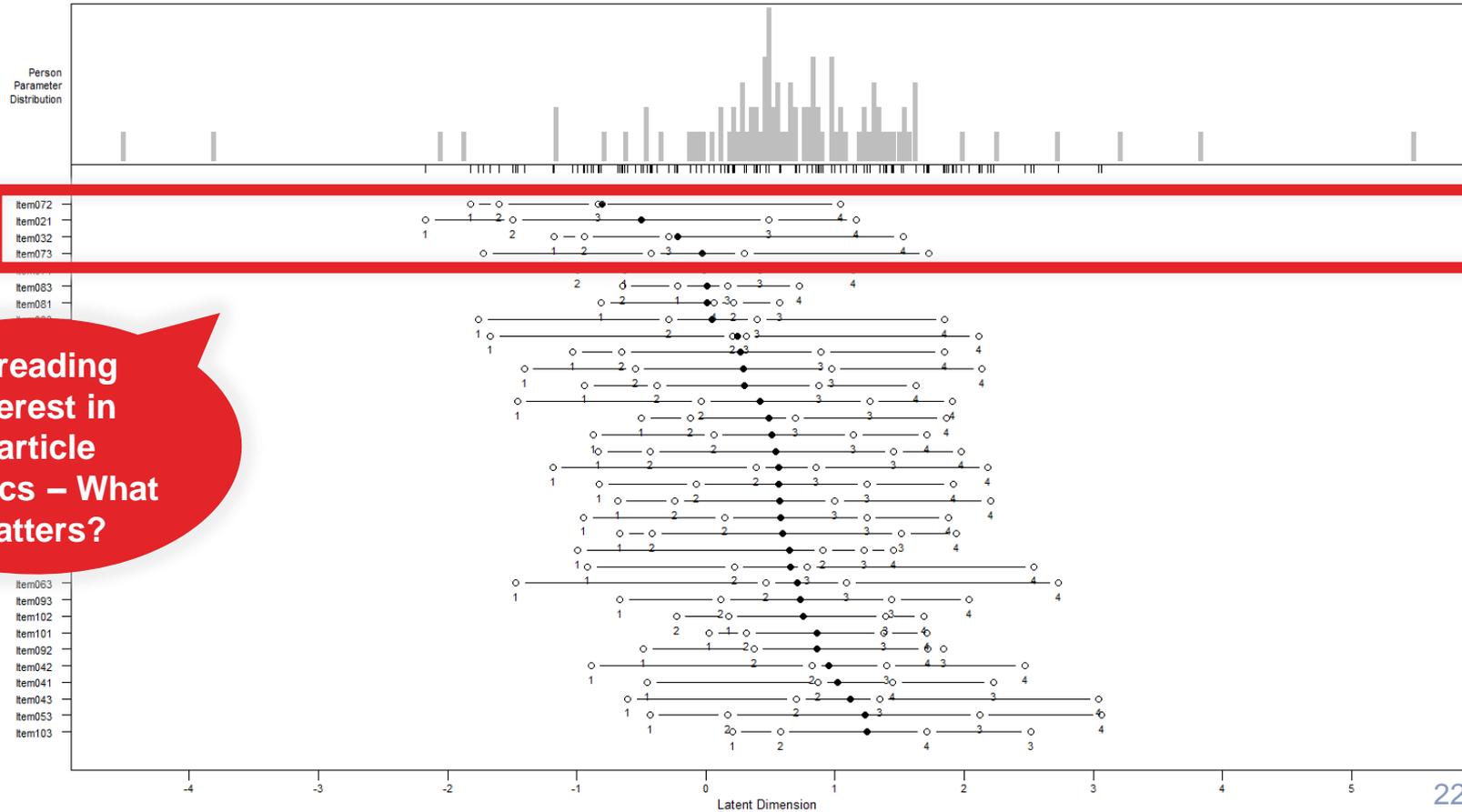
Person-Item Map



A questionnaire is like a ruler



Person-Item Map



Spreading
interest in
particle
physics – What
matters?



Research outlook

1. How **interested** are high-school students in **modern physics contents** in comparison to classical ones?
2. How can students be categorised into **interest types** while considering clustering variables beyond gender?
3. How **interested** are high-school students in **contexts** while focusing on **modern physics contents**?
4. Which **characteristics of contexts** are particularly **interesting**?

Study #1

Study #2



Hypotheses

Study #1

1. **Modern physics contents** are **more interesting** for high-school students than classical ones.
2. Interest **types** (1, 2) are **still valid** for today's students.
3. When using **self-concept** instead of gender **as clustering variable**, the interest types are described better.

