

# ÜGK – COFO – VeCoF

## Assessment of Basic Competencies in Switzerland Focus: ÜGK16

**Swiss Educational Data Symposium, December 9, 2021 (online)**

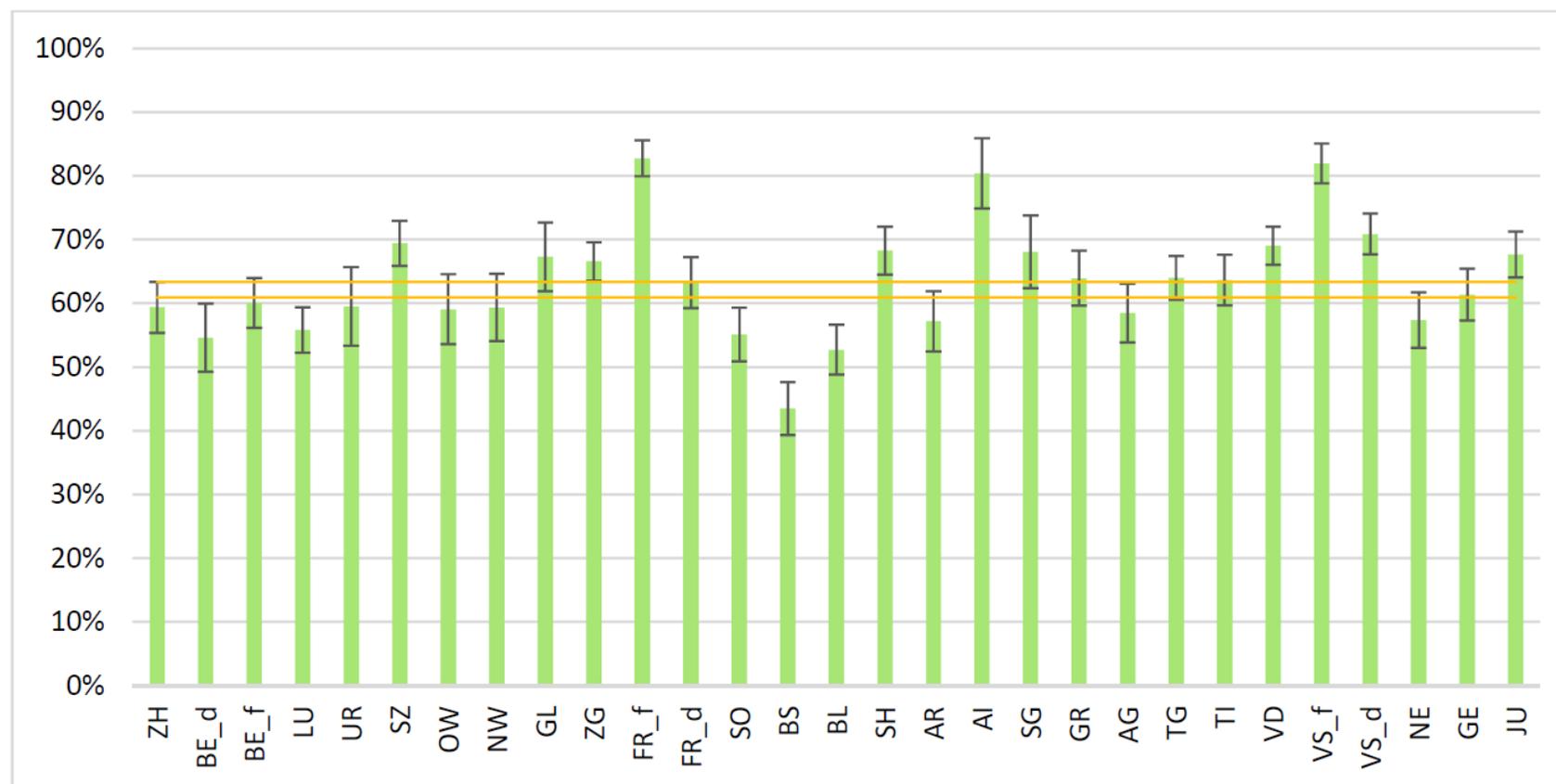
Andrea Erzinger, Simon Seiler – Interfaculty Center for Educational Research  
[andrea.erzinger@unibe.ch](mailto:andrea.erzinger@unibe.ch), [simon.seiler@unibe.ch](mailto:simon.seiler@unibe.ch)

# Agenda

- Background, Mandate and Aim
- Sampling
- Test Data
- Student Questionnaire
- Analyzing Data

# Background, Mandate and Aim

## Aim: Percentage achieving basic competencies



- in Switzerland
- per canton
- in a specific subject
- at some point in the school career

Konsortium UGK (Hrsg.) (2019). *Überprüfung der Grundkompetenzen. Nationaler Bericht der ÜGK 2016: Mathematik 11. Schuljahr.* Bern und Genf: EDK und SRED.  
<https://doi.org/10.18747/PHSG-coll3/id/386>

# Background, Mandate and Aim

## National education standards: basic competencies

Benchmarks of harmonization in the school system, e.g. objectives of the educational levels (Federal Constitution of Switzerland, 2006, Art. 62, paragraph 4)



Development of governance tools to ensure the quality of the education system (HarmoS-Konkordat, 2009)

Basic competencies as national education standards: agreed by the EDK in 2011 (EDK, 2011a, 2011b, 2011c, 2011d)

For the following subjects and at some points in school career:

- School language L1
- Mathematics
- Science

at the end of grade HarmoS 4, 8 and 11 of compulsory school (at the end of cycle 1, 2 and 3)

- Foreign language L2
- Foreign language L3

at the end of grade HarmoS 8 and 11 of compulsory school (at the end of cycle 2 and 3)

ÜGK  
Schweiz

COFO  
Suisse

VeCoF  
Svizzera

# ÜGK/COFO/VECOF

## Verification of the achievement of the basic competencies [\(https://uegk-schweiz.ch/\)](https://uegk-schweiz.ch/)

Large-scale assessment in compulsory school with national achievement tests covering the basic competencies

-> Determine the extent to which national educational goals are being met in Switzerland and in each canton

About 20'000 students per assessment, adequately representing the respective population

Mandated by the EDK (Cantonal education departments)



Bemerkungen:

\* Es wird eine Zählweise verwendet, welche alle Jahre des Schulobligatoriums (1–11) umfasst, d. h. zwei Jahre Kindergarten oder die ersten beiden Jahre einer Eingangsstufe sind darin eingeschlossen.

Pilot: Piloterhebung

FT: Field Trial (Piloterhebung)

MS: Main Study (Haupterhebung)

L1: Schulsprache

L2: erste unterrichtete Fremdsprache (2. Landessprache oder Englisch)

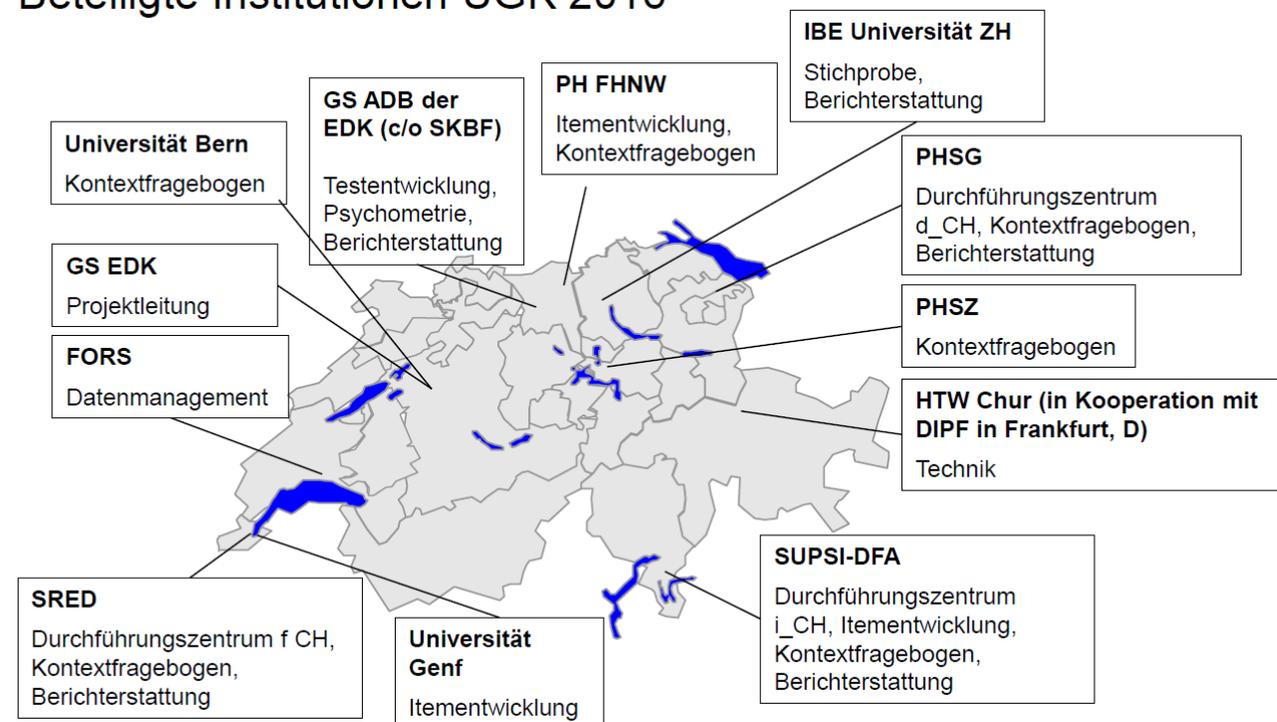
L3: zweite unterrichtete Fremdsprache

# ÜGK 2016 H11

## Mathematics

- All the Swiss cantons
- Standardized tests in Mathematics & student questionnaire
- May, 2nd, to Juni, 10th, 2016
- Realisation: according to a standardized procedure under the supervision of project staff, computer-based and online, using the school infrastructure

### Beteiligte Institutionen ÜGK 2016



# Background, Mandate and Aim

## Further Reading

EDK-Plenarversammlung. (2011). Nationale Bildungsstandards. Zugriff am August 2021. Verfügbar unter: <https://www.cdep.ch/de/themen/harmos/nationale-bildungsziele>  
Konsortium ÜGK (Hrsg.). (2019a). *Überprüfung der Grundkompetenzen. Nationaler Bericht der ÜGK 2016: Mathematik 11. Schuljahr*. Bern & Genf: EDK & SRED.  
<https://doi.org/10.18747/PHSG-coll3/id/386>

EDK. (2011a). *Grundkompetenzen für die Fremdsprachen. Nationale Bildungsstandards*. Bern: EDK. Zugriff am 29.06.2020. Verfügbar unter:  
[https://edudoc.ch/record/96780/files/grundkomp\\_fremdsprachen\\_d.pdf](https://edudoc.ch/record/96780/files/grundkomp_fremdsprachen_d.pdf)

EDK. (2011b). *Grundkompetenzen für die Naturwissenschaften. Nationale Bildungsstandards*. Bern: EDK. Zugriff am 29.06.2020. Verfügbar unter:  
[https://edudoc.ch/record/96787/files/grundkomp\\_nawi\\_d.pdf](https://edudoc.ch/record/96787/files/grundkomp_nawi_d.pdf)

EDK. (2011c). *Grundkompetenzen für die Naturwissenschaften. Nationale Bildungsstandards*. Bern: EDK. Zugriff am 29.06.2020. Verfügbar unter:  
[https://edudoc.ch/record/96787/files/grundkomp\\_nawi\\_d.pdf](https://edudoc.ch/record/96787/files/grundkomp_nawi_d.pdf)

EDK. (2011d). *Grundkompetenzen für die Schulsprache. Nationale Bildungsstandards*. Bern: EDK. Zugriff am 29.06.2020. Verfügbar unter:  
[https://edudoc.ch/record/96791/files/grundkomp\\_schulsprache\\_d.pdf](https://edudoc.ch/record/96791/files/grundkomp_schulsprache_d.pdf)

Konsortium ÜGK (Hrsg.). (2019a). *Überprüfung der Grundkompetenzen. Nationaler Bericht der ÜGK 2016: Mathematik 11. Schuljahr*. Bern & Genf: EDK & SRED.  
<https://doi.org/10.18747/PHSG-coll3/id/386>

Konsortium ÜGK (Hrsg.). (2019b). *Überprüfung der Grundkompetenzen. Nationaler Bericht der ÜGK 2017: Sprachen 8. Schuljahr*. Bern & Genf: EDK & SRED.  
<https://doi.org/10.18747/PHSGcoll3/id/385>

# ÜGK16: Design and Data

# Sampling

## Mixed Design

### Types of sampling procedures

- **Census** in 11 cantons (or parts)  
6'288 out of 6'689 students
- **One-stage sampling** in 12 cantons  
8'976 out of 28'382 students
- **Two-stage sampling** in 6 cantons  
364 out of 963 school  
7'159 out of 45'785 students

### Data

- **$N = 22'423$**  students
- **Sampling weights** to account for differences in sampling probability
- **Replicate weights** (balanced repeated replication, BRR)  
to account for survey design (clustering and stratification)

# Sampling

## Further Reading / Resources

- Verner, M., & Helbling, L. (2019). *Sampling ÜGK 2016. Technischer Bericht zu Stichprobendesign, Gewichtung und Varianzschätzung bei der Überprüfung des Erreichens der Grundkompetenzen 2016*. Zürich: Institut für Bildungsevaluation, assoziiertes Institut der Universität Zürich.  
[https://uegk-schweiz.ch/wp-content/uploads/2019/05/%C3%9CGK2016\\_Verner\\_Helbling\\_2019\\_-Sampling-%C3%9CGK-2016.pdf](https://uegk-schweiz.ch/wp-content/uploads/2019/05/%C3%9CGK2016_Verner_Helbling_2019_-Sampling-%C3%9CGK-2016.pdf)
- Hupka-Brunner, Sandra; Jann, Ben; Koomen, Maarten; Krebs-Oesch, Dominique Fabienne; Meyer, Thomas; Müller, Barbara; von Rotz, Christina; Sacchi, Stefan; Wilhelmi, Barbara (2021). *TREE2 study design* Bern: TREE <http://dx.doi.org/10.48350/152018>

# Test Data

## Model of Competence

### Contents (“Kompetenzbereiche”)

- Data and randomness
- Quantities and measures
- Functional relationships
- Number and variable
- Shape and space

### Competencies (“Handlungsaspekte”)

- Arguing and reasoning
- (Re-)presenting and communicating
- Knowing, recognizing and describing
- Mathematising and modelling
- Operating & Calculating
- Using instruments and tools
- Interpreting and reflecting on the results
- Investigating and exploring

# Test Data

## Scales

### Scales based on Rasch-Model

- Item-Pool:  
132 items combined in 13 test booklets
- Each student answered  
4 out of 13 test booklets
- Using Rasch models, scaled scores  
have been estimated

### Scales and plausible values

- Global scale for mathematics
- Subscales for each type of content
- Subscales for each competency
- 20 plausible values (multiple imputations)  
for each (sub-) scale reflecting the  
measurement error

# Test Data

## Standard Setting

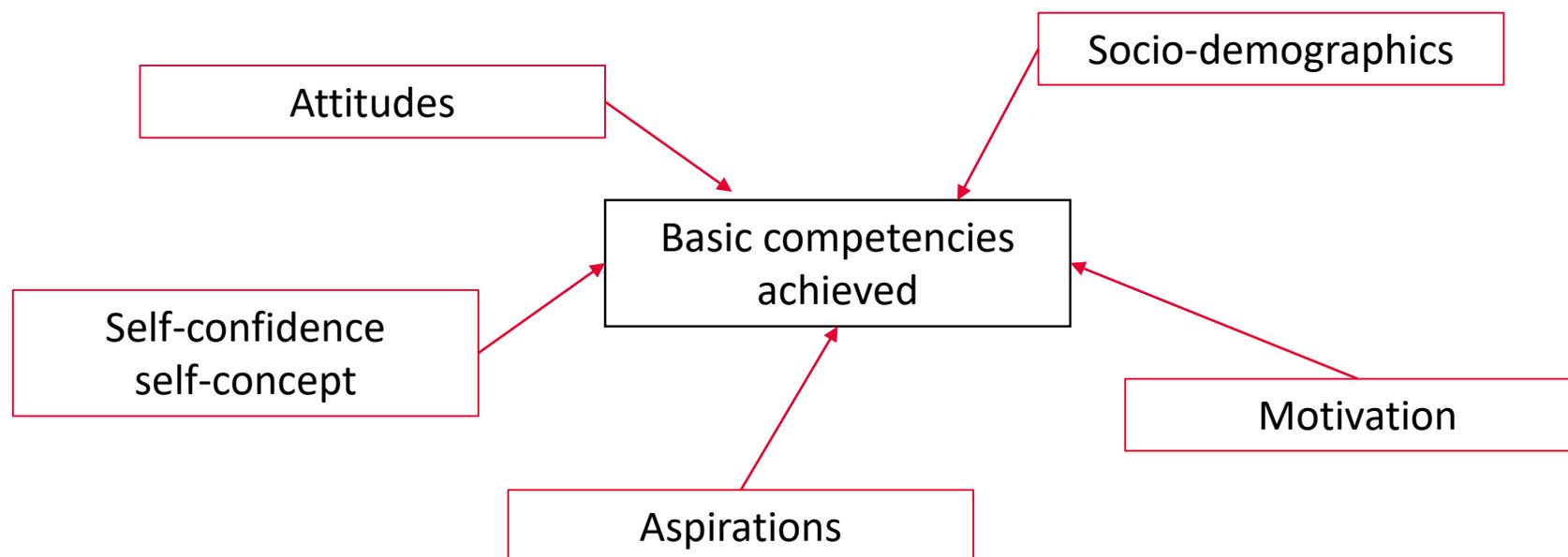
- **Threshold defined by group of experts**
- Basic competencies:  
Items with difficulty below threshold
- Above basic competencies:  
Items with difficulty above threshold
- 62.2% of students were able to solve items within range of basic competencies  
= basic competencies achieved
- Data include dichotomous plausible values “achieved” vs. “not achieved”

# Test Data

## Further Reading / Resources

- Angelone, D., & Keller, F. (2019). [ÜGK 2016 Mathematik. Technische Dokumentation zu Testentwicklung und Skalierung.](#) Aarau: Geschäftsstelle der Aufgabendatenbank EDK (ADB).
- Girnat, B., & Linneweber-Lammerskitten, H. (2019). [Schlussbericht zur Entwicklung mathematischer Testitems für die Überprüfung der Grundkompetenzen der Jahrgangsstufe 11 in Mathematik auf der Grundlage des HarmoS Kompetenzmodells Mathematik.](#) Basel: FHNW.

# Student Questionnaire



# Student Questionnaire Modules

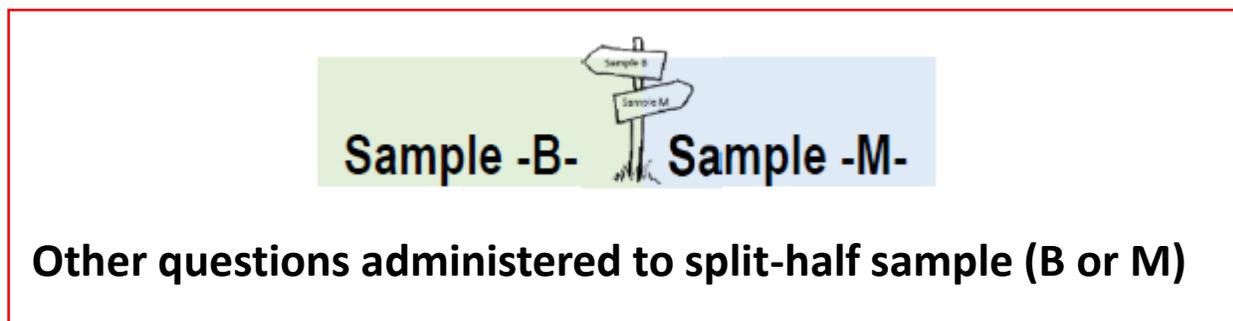
## Monitoring module

General questions

## Mathematics module

Factors related to mathematical achievement

Core questions of both modules administered to full sample



# Student Questionnaire

## Monitoring Module

### General questions

- Social origin and migration background
- Educational aspirations, educational decisions and educational pathways
- Self-concepts, motivation, health, well-being and critical life events
- Social integration
- ICT use, ICT attitudes and ICT skills

# Student Questionnaire

## Mathematics Module

### Potential factors influencing mathematical achievement:

- Individual background for learning mathematics.
  - Motivation, interest, emotion, self-concept, self-efficacy, attitudes.
- Characteristics of mathematics teaching or aspects of mathematics didactics.
  - Teaching and learning methods, perception of mathematical content, lesson design.
- Contextual factors or aspects of the learning environment.
  - School situation, expectations of parents and classmates, appreciation of mathematics in the classroom.

# Student Questionnaire

## Further Reading / Resources

- Questionnaires shipped with data
- Hascher, T., Brühwiler, C., & Girnat, B. (2019). [\*Erläuterungen zu den Skalen des Kontextfragebogens der ÜGK 2016 Mathematikteil: Theoretischer Hintergrund und Forschungsinteressen.\*](#) Bern: Universität Bern, Pädagogische Hochschule St. Gallen (PHSG) und Pädagogische Hochschule FNHW.
- Hupka-Brunner, S., Jann, B., Meyer, T., Imdorf, C., Sacchi, S., Müller, B. et al. (2016). [\*Erläuterungen zum Kontextfragebogen der ÜGK 2016: Allgemeiner Teil.\*](#) Bern: Universität Bern.
- Pham, G., Helbling, L., Verner, M., Petrucci, F., Angelone, D., & Ambrosetti, A. (2019). [\*ÜGK– COFO – VeCoF 2016 results: Technical appendices.\*](#) St.Gallen & Genf: Pädagogische Hochschule St.Gallen (PHSG) & Service de la recherche en éducation (SRED).

# Analyzing Data

## Missing Data (Item Non-Response)

- Currently no imputations in SUF  
-> But new release will be available soon (imputations of core variables)
- Substantial non-response on some items (e.g., parents' educational attainment), other items less problematic
- State-of-the-art methods for dealing with missing data should be considered (multiple imputation, full information maximum-likelihood method)

# Analyzing Data

## Complex Sampling Design

- Proper way
  - Standard errors / confidence intervals based on replicate weights provided in the data
- Conservative linearization (consider clustering within schools):
  - Cantons with two-stage sampling:  
Strata: Cantons  
PSUs: Schools
  - Other cantons:  
Strata: Schools  
PSUs: Students

# Analyzing Data

## Measurement Error

- Test performance is estimated based on a subset of test items -> measurement error
- Proper way (strongly recommended if analyses focus on test performance):
  - Estimate your models using the full set of plausible values (PVs)
  - Note: ÜGK is designed with a binary response (achieved vs. not achieved) in mind. The continuous scales have no clear interpretation.
- Simplified way (especially if test performance is used as control variable):
  - Use weighted likelihood estimate (WLE) provided in data (single variable)

# Analyzing Data Software

- SPSS
  - Additional software components required for considering replicate weights and PVs
  - IDB Analyzer includes necessary components -> shipped with data from FORSbase
- R
  - The BIFIE-Survey package has specifically been developed for analyzing large scale assessments such as ÜGK
- Stata
  - -svy brr- for considering replicate weights
  - -mi- for analyzing PVs
  - Unfortunately, the combination of -svy brr- is not supported and need a workaround  
Contact me, if you need more information on analyzing ÜGK with Stata

# Analyzing Data

## Further Reading / Resources

- Data: Available on FORSbase, with prior agreement of authors:  
<https://forsbase.unil.ch/project/study-public-overview/16165/0/>
- Documentation shipped with data
- Verner, M., & Helbling, L. (2019). *Sampling ÜGK 2016. Technischer Bericht zu Stichprobendesign, Gewichtung und Varianzschätzung bei der Überprüfung des Erreichens der Grundkompetenzen 2016*. Zürich: Institut für Bildungsevaluation, assoziiertes Institut der Universität Zürich.  
[https://uegk-schweiz.ch/wp-content/uploads/2019/05/%C3%9CGK2016\\_Verner\\_Helbling\\_2019\\_-Sampling-%C3%9CGK-2016.pdf](https://uegk-schweiz.ch/wp-content/uploads/2019/05/%C3%9CGK2016_Verner_Helbling_2019_-Sampling-%C3%9CGK-2016.pdf)  
-> Anhang C: Auswertungshinweise
- Schreiner, Claudia & Breit, Simone (Ed). (2016). *Large-Scale Assessment mit R. Methodische Grundlagen der österreichischen Bildungsstandardüberprüfung*. Wien: facultas.
- OECD (2009), *PISA Data Analysis Manual: SPSS, Second Edition*, PISA, OECD Publishing, Paris, <https://doi.org/10.1787/9789264056275-en>

# Concluding Remarks

- Unique opportunity to study educational achievement across all Swiss cantons
- Rich background questionnaire makes it possible to study a broad range of research questions related to education
- Design and data similar to PISA:  
Straightforward for researcher familiar with data from large scale assessment
- ÜGK16:  
Baseline survey of TREE2  
-> follow a subsample of the students through their transitions from education to employment

Thanks for your interest in ÜGK