



SPP 1646 Summer School 2016

*Competence Development and Educational
Inequalities*

*Theoretical Concepts and
Methodological Implementations*

at

**Leibniz Institute for Educational Trajectories
Bamberg, Germany**

11-19 July 2016

Organized by:

Sabine Weinert

Hans-Peter Blossfeld

Coordinated by:

Lena Nusser



In cooperation with



ORGANIZATIONAL INFORMATION

The SPP 1646 Summer School seeks to promote young researchers connected to the DFG Priority Programme 1646 “Education as a Lifelong Process – Analyzing Data of the National Educational Panel Study” by strengthening their theoretical and methodological skills in educational research. This first Summer School of the second phase offers a seven-day program with various teaching and learning formats.

The Summer School starts on Monday, 11th of July. Each day focuses either a theoretical or a methodological topic relevant to educational researchers. In the mornings, there will be theoretical lectures on different themes of educational research held by leading researchers from different disciplines (sociology, educational research, psychology, and statistics). In the afternoons, these experts will organize discussion sessions in which the research papers submitted by Summer School participants will be discussed. All participants of the SPP1646 Summer School are welcome to join these discussion sessions and are expected to actively engage in the discussion of each paper. Research papers will be available for download (password protected) on the SPP website (<https://spp1646.neps-data.de/>).

Furthermore, introductory as well as advanced topics in quantitative methods for the analysis of educational processes will be presented in the form of lectures combined with practical data exercises.

The recommended literature and workshop materials will also be available for download (password protected) on the SPP website (<https://spp1646.neps-data.de/>).

During the last two days of the Summer School a NEPS-Data Workshop with special focus on imputation and missing data will be offered. Researchers will also be introduced to the most recent data releases of the NEPS as well as receive individual assistance with the NEPS data.

The Summer School Program is supplemented by two social events. On Tuesday, 12th of July, participants are invited to a joint conference dinner, giving them the opportunity to get in touch with each other and also with the invited experts in an informal setting. On Thursday, 14th of July, participants will have the opportunity to join a guided city tour through Bamberg.

PROGRAM OVERVIEW

	Monday (11.07.)	Tuesday (12.07.)	Wednesday (13.07.)	Thursday (14.07.)	Friday (15.07.)
	Welcome		Discussion Session V		
Morning	Michael Kavšek <i>Habituation-Dishabituation-Paradigm</i>	Cordula Artelt <i>Reading Competence</i>	Johannes Hartig <i>Item Response Theory and Competence Modelling</i>	Cornelia Kristen <i>Language Acquisition of Immigrants</i>	David Kaplan <i>Workshop on Bayesian Statistics</i>
	Discussion Session I	Timo Ehmke <i>Mathematical literacy</i>	Claus H. Carstensen <i>Longitudinal Competence Modelling and Linking within the NEPS</i>	Alessandra Minello <i>Gender, Education and Employment</i>	
Afternoon	Discussion Session II	Discussion Session III	Götz Rohwer <i>Using NEPS Data for Comparing Math Competencies at grade 5 & 7</i>	Discussion Session VI	
		Discussion Session IV	Final Discussion on Assessing and Analyzing Competences		
Evening		Joint Diner at Salino		Guided City Tour	

	Monday (18.07.)	Tuesday (19.07.)			
	NEPS-Data Workshop on Imputation				
Morning	Assistance with NEPS data	Ariane Würbach <i>Example for Imputing Data</i>			
Afternoon	Susanne Rässler <i>Introduction to Imputation</i>	Hands-on-work with NEPS-Data			

DETAILED PROGRAM

Monday, July 11, 2016	
08.45 – 09.15	Registration
09.15 – 09.30	Sabine Weinert (University of Bamberg) & Hans-Peter Blossfeld (European University Institute) <i>Welcome & Introduction to the Summer School</i>
Part I:	
09.30 – 11.00	Michael Kavšek (University of Bonn): <i>Habituation-Dishabituation-Paradigm</i>
11.00 – 11.15	Coffee Break
11.15 – 12.45	Discussion Session I <i>Papers by M. Nachbauer and N. Hübner</i>
12.45 – 14.15	Lunch Break
14.15 – 15.45	Discussion Session II (M. Kavšek) <i>Papers by K. Nübel and J.-D. Freund</i>
15.45 – 16.00	Coffee Break
Tuesday, July 12, 2016	
Part II: Assessing and Analyzing Competences	
09.30 – 11.00	Cordula Artelt (University of Bamberg): <i>Reading Competence: Test construction and Assessment in the NEPS</i>
11.00 – 11.15	Coffee Break
11.15 – 12.45	Timo Ehmke (Leuphana University of Lüneburg): <i>Mathematical literacy: Linking PISA & NEPS</i>
12.45 – 14.15	Lunch Break
14.15 – 15.45	Discussion Session III (T. Ehmke) <i>Papers by T. Rohm and J. Lambrecht</i>
15.45 – 16.00	Coffee Break
16.00 – 17.30	Discussion Session IV (G. Rohwer) <i>Papers by D. Kiss and M. Penny</i>
19.00	Joint Conference Diner at Salino

Wednesday, July 13, 2016	
08.30 – 10.00	Discussion Session V (J. Hartig) <i>Papers by L. Fischer and E. Stets</i>
10.00 – 10.15	Coffee Break
10.15 – 11.45	Johannes Hartig (DIPF): <i>Item Response Theory and Competence Modelling</i>
11.45 – 13.15	Claus H. Carstensen (University of Bamberg): <i>Longitudinal Competence Modelling and Linking within the NEPS</i>
13.15 – 14.15	Lunch Break
14.15 – 15.45	Götz Rohwer (University of Bochum): <i>Using NEPS Data for Comparing Math Competencies at Grade 5 and 7</i>
15.45 – 16.00	Coffee Break
16.00 – 17.30	Final Discussion on Assessing and Analyzing Competences
Thursday, July 14, 2016	
Part III	
09.30 – 11.00	Cornelia Kristen (University of Bamberg): <i>Language acquisition of recently arrived immigrants in four European destinations</i>
11.00 – 11.15	Coffee Break
11.15 – 12.45	Alessandra Minello (European University Institute) <i>Gender, Education and Employment</i>
12.45 – 14.15	Lunch Break
14.15 – 15.45	Discussion Session VI <i>Papers by A. E. Hägglund and J. Seuring</i>
15.45 – 16.00	Coffee Break
17.00	Guided City Tour (Meeting point: Tourist Information, Geyerswörthstr. 5)

Friday, July 15, 2016	
Part IV: Workshop on Bayesian Statistics	
9.00 – 10.30	Introduction to Bayesian Statistics (Part I)
10.30 – 10.45	Coffee Break
10.45 – 12.15	Introduction to Bayesian Statistics (Part II)
12.15 - 13.45	Lunch Break
13.45 – 15.15	Introduction to Bayesian Statistics (Part III)
15.15 – 15.30	Coffee Break
15.30 – 17.00	Introduction to Bayesian Statistics (Part IV)
Monday, July 18, 2016	
Part V: NEPS-Data Workshop on Imputation (Room 109A)	
10.00 – 12.30	Assistance with NEPS data
12.30 – 14.00	Lunch Break
14.00 – 15.30	Susanne Rässler (University of Bamberg) <i>Introduction to Imputation – What you always wanted know about imputation and missing data but were always afraid to asked! (Part I)</i>
15.30 – 16.00	Coffee Break
16.00 – 17.00	Susanne Rässler (University of Bamberg) <i>Introduction to Imputation – What you always wanted know about imputation and missing data but were always afraid to ask! (Part II)</i>
Tuesday, July 19, 2016	
09.00 – 11.00	Ariane Würbach (LifBi e.V.) <i>Example for imputing data</i>
11.00 – 11.15	Coffee Break
11.15 – 12.45	Imputing data with assistance
12.45 – 14.15	Lunch Break
14.15 – 16.00	Hands on work with NEPS-Data

LOCATION

The meeting will be held at the LIfBi e.V. Wilhelmsplatz 3, 96047 Bamberg (Wilhelmspost, Room 104).

REGISTRATION

Registration will open on July, 11, at 8.30 and will be open throughout the whole duration of the Summer School. The registration desk can be found in the hallway on the first floor of the Wilhelmspost.

LECTURES

The lectures and workshops will be held by distinguished international scholars in the fields of educational research and statistical methods. All lectures will be held in Room 104 on the first floor. Participants are expected to prepare for the lectures by reading literature suggested by the lecturers and to actively participate in the discussion of the research ideas of the other Summer School participants.

DISCUSSION SESSIONS

In the discussion sessions PhD and post PhD students will be given the opportunity to present and discuss their PhD projects and papers with the invited experts.

The participant is expected to give a very short presentation on his/her thesis idea or of a certain research paper at the Summer School before the assigned expert discusses the theme of the paper and gives feedback on theoretical and methodological aspects. Afterwards there will be the opportunity to discuss further questions in the plenum.

INTERNET ACCESS

The University of Bamberg participates in the Eduroam Project. For further information please visit: <http://www.uni-bamberg.de/rz/dienstleistungen/netz/wlan/eduroam/>

ACCOMMODATIONS AND TRAVEL COSTS

Travel costs, expenses for overnight accommodation, breakfast, joint conference dinner will be met by the SPP coordination project for SPP members. Lunch is not covered, but recommendations will be given.

Travel expenses (by train: ticket for 2nd class; by car: 0.35 € per kilometer with justified reason or 0.25€ per kilometer with unjustified reasons¹) will be reimbursed after the meeting. Please make sure to save your original travel tickets until after the conference.

¹ Regulations of the Bavarian Travel Expense Law (BayRKG): As justified reasons classify business-related or personal reasons (e.g. business place is not reachable by public transportation on time; necessary, heavy

DIRECTIONS TO THE LIFBI (WILHELMSPOST)

By train (it takes about 10 to 15 minutes to walk to the Wilhelmspost):

- You stand in front of the building of the railway station and just take the street opposite of you, named 'Luitpoldstraße'.
- Follow this street until you have passed the canal bridge. Then, turn left onto 'Heinrichsdamm'.
- After about 300 meters, you arrive at an intersection where you also find a second canal bridge ('Marienbrücke').
- The LifBi in the historical building 'Wilhelmspost' is on the back right of this intersection, namely at the corner 'Heinrichsdamm'/'Wilhelmstraße'.

By car

Coming from Autobahn A73:

- Exit Autobahn A73 at 'Bamberg Ost'.
- Stay on 'Pödelderfer Straße' and follow signs to 'Innenstadt' (city center).
- Follow this street for about 4.5 kilometers and until having passed the canal bridge ('Marienbrücke').
- Turn left into 'Heinrichsdamm' directly after this canal bridge.
- You find the historical building 'Wilhelmspost' on your right.

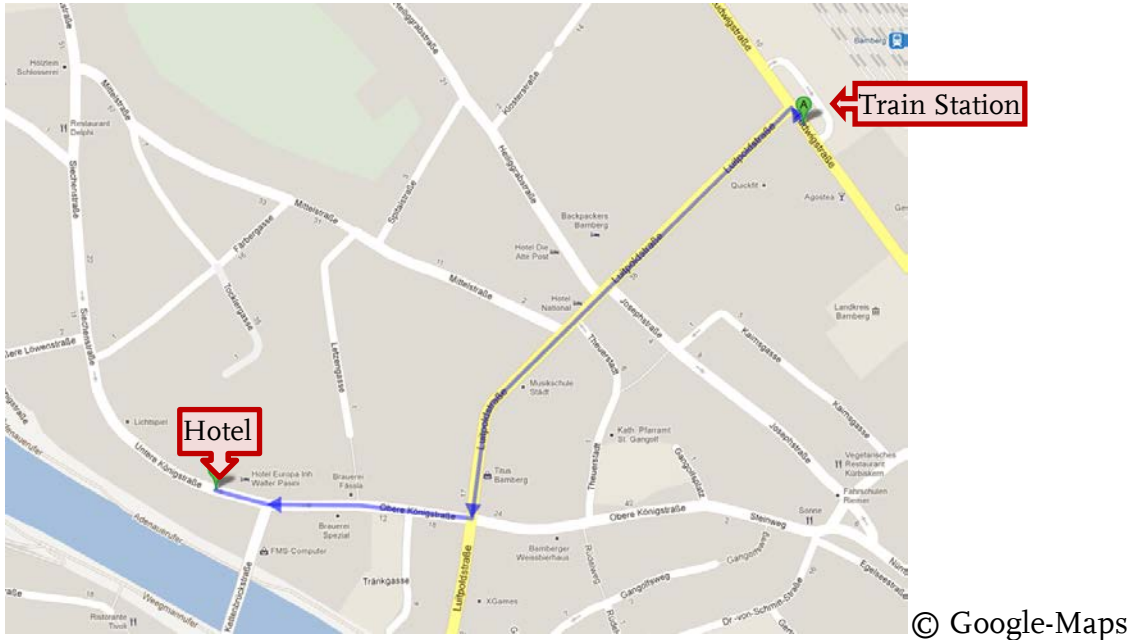
Coming from Autobahn A70:

- Exit Autobahn A70 at 'Bamberg' and take the 'Berliner Ring' to Bamberg city center.
- Stay on this highway. After about 3.5 kilometers, you reach an intersection with a 'Hein Gericke' shop on your right.
- Turn right into 'Starkenfeldstraße'. Follow this street for about 2 kilometers and until having passed the canal bridge ('Marienbrücke').
- After this canal bridge, turn left into 'Heinrichsdamm'. You find the LifBi in the historical building 'Wilhelmspost' on your right.

CONFERENCE HOTELS

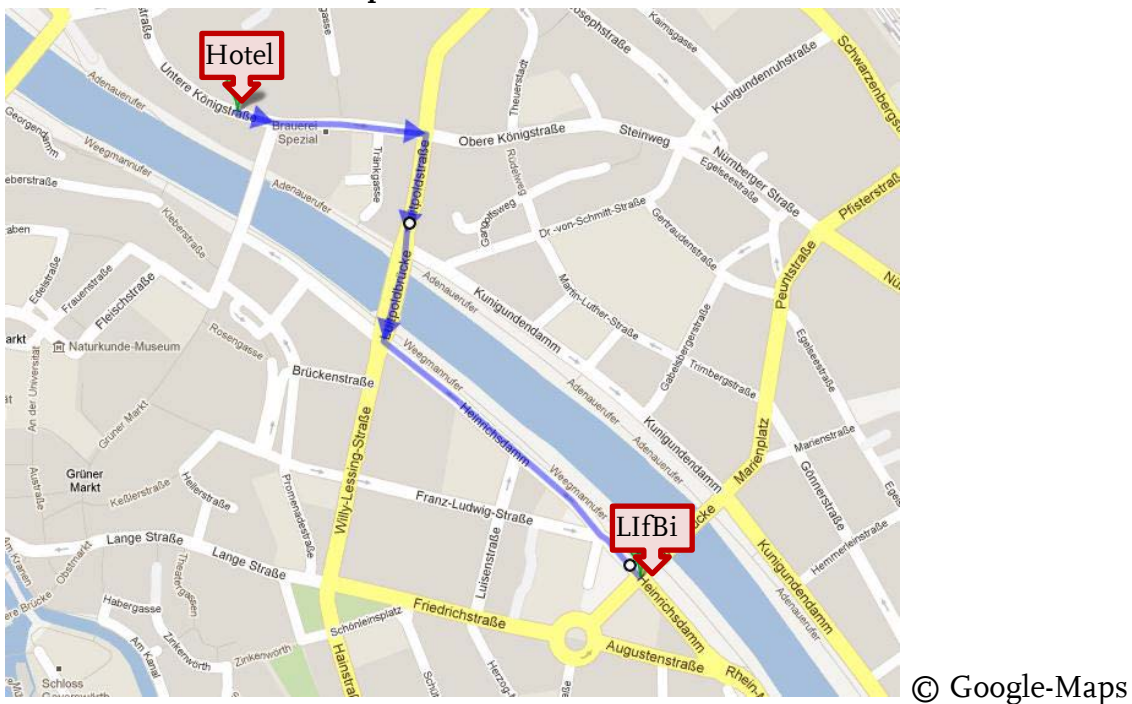
The 'Hotel Europa' is located at Untere Königstraße 6-8, 96052 Bamberg. From the train station it is a 10 minutes' walk to the hotel.

Route from the Train Station to the Hotel Europa



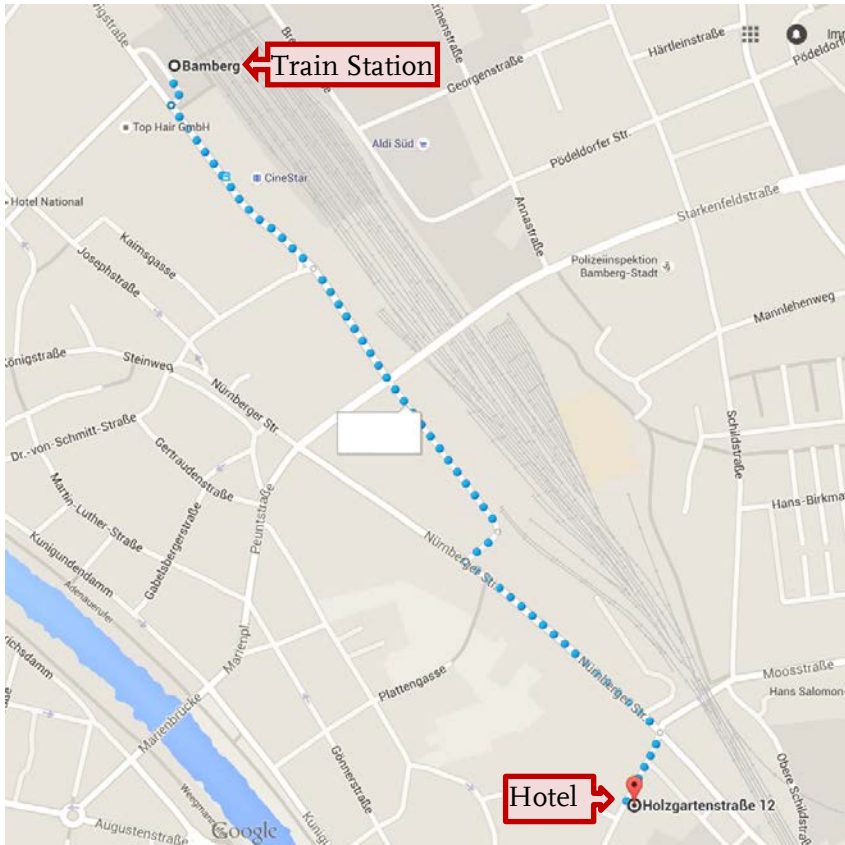
For further information please visit the hotel website: <http://www.hotel-europa-bamberg.de>. Expenses for overnight accommodation and breakfast will be met by the SPP coordination project.

Route from the Hotel Europa to the LIfBi



The 'Hotel am Brauerei-Dreieck' is located at Holzgartenstraße 12, 96050 Bamberg. From the train station it is a 15 minutes' walk to the hotel.

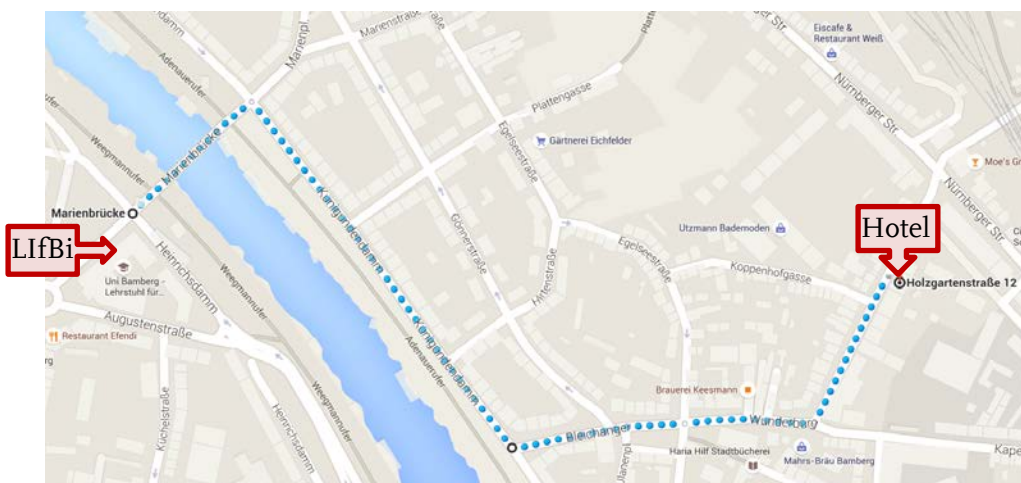
Route from the Train Station to the Hotel am Brauerei-Dreieck'



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For further information please check your confirmation of registration or visit the hotel website: <http://www.hotel-am-brauerei-dreieck.de/>. Expenses for overnight accommodation and breakfast will be met by the SPP coordination project. Please remember that you need a door code that was send to you separately with your confirmation of registration documents.

Route from the Hotel am Brauerei-Dreieck' to the LifBi

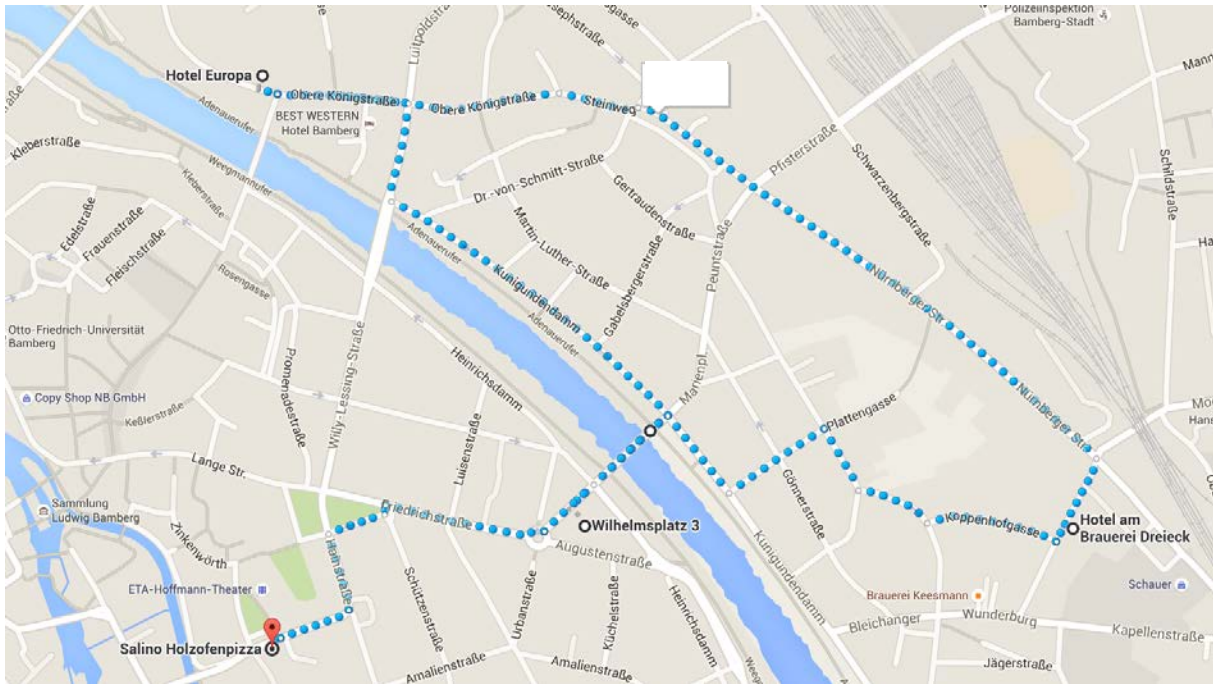


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JOINT CONFERENCE DINER

A meeting dinner will be held on the evening of Tuesday, July 12 at the Salinos (Italian restaurant), Schillerplatz 11, 96047 Bamberg. The dinner is free for SPP members and invited experts.

Locations of the Hotels, the LifBi and the Salino Restaurant



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LECTURES & WORKSHOPS

Kavšek, Michael

University of Bonn, Germany, E-mail: kavsek@uni-bonn.de

“Habituation-Dishabituation-Paradigm”

Abstract: During the last decades, progress in research on infant perceptual, cognitive, and social-emotional development has been driven by the visual habituation-dishabituation method. Habituation is the decline of interest in a repeatedly presented stimulus. Dishabituation is the subsequent reactivation of attention evoked by a novel stimulus. According to the cognitive model, habituation indicates the construction of a memory trace of the habituation stimulus, and dishabituation indicates discrimination between this memory trace and a novel stimulus (e.g., Sokolov, 1963).

Several theoretical and neurophysiological models have extended the cognitive interpretation of habituation and dishabituation. Research measuring heart rate changes during stimulus presentation suggests that infant visual fixation reflects stimulus encoding (sustained attention) as well as inhibitory processes (attention termination). Moreover, electrophysiological studies have revealed specific event-related potential signals correlating with habituation and dishabituation. Ruff and Rothbart (1996; Rothbart & Bates, 2006) delineate that infant visual habituation and dishabituation between about 3 and 9 months of age is controlled by the reactive attentional system. This system is located in posterior brain areas. From approximately 9 months of age onward, the executive attention system begins to emerge. This system, one task of which is to maintain attention during object examination, is assigned to frontal cortical structures. It causes an age-related increase in infants' exploration of complex objects.

The cognitive model has also been corroborated by behavioral studies. These studies have established striking interindividual differences in information processing between short- and long-looking infants and between clinical and non-clinical samples. Furthermore, habituation and dishabituation predict later cognitive outcomes.

In sum, the information processing view of infant habituation and dishabituation is supported by several lines of evidence. Moreover, current empirical findings contribute to an increasingly better understanding of the neural processes underlying habituation and dishabituation. A major task for future research is to translate our knowledge about habituation-dishabituation into early measures of infant cognition.

Literature Recommendations:

Nelson, C. A. (1998). The nature of early memory. *Preventive Medicine*, 27, 172–179.

Reynolds, G. D. (2015). Infant visual attention and object recognition. *Behavioural Brain Research*, 285, 34–43.

Richards, J. E. (2004). The development of sustained attention in infants. In M. Posner (Ed.), *Cognitive neuroscience of attention* (pp. 342–356). New York: Guilford Press.

Ruff, H. A., & Rothbart, M. K. (1996). *Attention in early development: Themes and variations*. New York: Oxford University Press.

Artelt, Cordula

University of Bamberg, Germany, E-mail: cordula.artelt@uni-bamberg.de

“Reading Competence: Test construction and Assessment in the NEPS”

Abstract: The assessment of reading competence is a central element of national and international large-scale-assessments. However, the theoretical background, framework specifications and operationalisations vary across time and studies (i.e. IEA’s Reading Literacy Studies in the 1970th, USA’s NAEP, Germany’s Assessment of Educational standards, OECD’s PISA, 2015). Furthermore, most studies implement (repeating) cross-sectional designs, and thus do not need to bother about the assessment of intra-individual change and linking of assessments across cohorts. NEPS, however, aims at assessing (reading) competence across the life span based on a coherent framework. The corresponding construction rationale of NEPS’ reading literacy tests is outlined and illustrated for selected starting cohorts. Moreover, the validity of the reading competence indicators and the specific strength (and weaknesses) of NEPS’s approach will be evaluated against the background of recent attempts to assess reading within Large-Scale Assessment. The talk ends with an outlook on recent developments related to the computer-based assessments, framework changes and adaptive assessment designs and its potential for future research.

Literature Recommendations:

Gehrer, K., Zimmermann, S., Artelt, C., & Weinert, S. (2013). NEPS framework for assessing reading competence and results from an adult pilot study. *Journal For Educational Research Online*, 5(2), 50-79.

Timo Ehmke

Leuphana University of Lüneburg, E-mail: tehmke@leuphana.de

“Mathematical literacy: Linking PISA & NEPS”

Abstract: Mathematical literacy is regarded as an important prerequisite to mastering problems of everyday life. In the German National Educational Panel Study (NEPS), mathematics has therefore been included as a central domain of competence development over the lifespan. To track the development of mathematical competence in individuals, instruments are needed that provide coherent and consistent

measures. The instruments are based on a theoretical framework of mathematical competence over the lifespan. This contribution focuses in the first part on the development and the structure of the NEPS assessment instruments for Mathematical Literacy. In the second part conceptual similarities and differences between the NEPS mathematics test and the mathematics assessments instruments in PISA and the German National Assessment at the end of secondary education (IQB-Ländervergleich) will be worked out by an expert rating. Results show a high conceptual overlap but also discover some detailed differences between the test instruments. The third part of the presentation examines a linkage between the international mathematics scale of the Programme for International Student Assessment (PISA 2012) and the mathematics assessment taken from the German National Educational Panel Study (NEPS). The linking between these two studies was realized by a separate linking study that uses a single group design. The sample consists of $n = 1,270$ 9th graders from 78 German secondary schools, who completed PISA on a first day and NEPS test instruments on a second day. With regard to different linking methodologies, the equipercentile equating technique was applied. The linking procedure leads to similar descriptive scale characteristics (means, standard deviation, skewness, and kurtosis) between the original PISA mathematics scale and the PISA score equivalents for the full sample. Altogether, the results indicate that assigning students to proficiency levels according to their test score, the NEPS (PISA) scores equivalents produce a very similar distribution of students reaching the PISA proficiency levels at a group level, compared to the frequency distribution based on the original PISA mathematics items. The contribution ends with an outlook on perspectives for further research using the NEPS mathematics data.

Literature recommendation:

Neumann, I., Duchhardt, C., Grüßing, M., Heinze, A., Knopp, E. & Ehmke, T. (2013): Modeling and assessing mathematical competence over the lifespan. *Journal for Educational Research Online*, 5(6), 80-109.

Hartig, Johannes

DIPF, Germany, E-mail: hartig@dipf.de

“Item Response Theory and Competence Modelling”

Abstract: In educational assessment, the term competence is associated with the idea of assessing abilities and skills that are needed in specific real life situations. In standardized tests for the assessment of competencies, the content of the test items should represent the demands of real-life situations that are relevant for the competence construct to be measured. Item response theory (IRT) provides a useful framework to model the interaction between test item demands and test-takers competencies, and to construct test scores based on item responses. The presentation

will first give a brief overview of IRT models in general, focusing on models for dichotomous response data. Furthermore, two specific utilizations of IRT for modelling competencies are outlined. First, IRT is particularly useful for the assessment of competencies as it constructs joint scales for item difficulties and individual competencies. This allows describing levels of competence with reference to item content and item demands. If a priori hypotheses about specific item demands exist, they can be examined using explanatory IRT models, which allow to estimate the effects of item characteristics within the IRT model. A second important class for models of competence is multidimensional IRT (MIRT). MIRT models allow to examine structures of complex, multidimensional competence constructs. Both explanatory IRT and MIRT are briefly illustrated by empirical applications.

Literature Recommendations:

Hartig, J. (2008). Psychometric models for the assessment of competencies. In J. Hartig, E. Klieme & D. Leutner (Hrsg.) *Assessment of competencies in educational contexts* (S. 69-90). Göttingen: Hogrefe & Huber Publishers.

Wilson, M. (2005): *Constructing measures. An item response modelling approach*. Mahwah: Lawrence Erlbaum.

Rohwer, Götz

University of Bochum, Germany, E-mail: goetz.rohwer@rub.de

“Using NEPS Data for Comparing Math Competencies at Grade 5 and 7”

Abstract: Using data from two tests of math competencies administered at grades 5 and 7 in starting cohort 3 of the National Educational Panel Study, the paper discusses how to quantify changes of the competencies. It is shown that equating the two tests with a joint Rasch model cannot be justified statistically. Moreover, the conception of a longitudinally valid test has to take into account that there is a cumulative development of new math competencies across educational stages. It is proposed that this can be achieved by a reference to the same set of items at both grades which allows using simple sum scores for a quantification of changes of competencies.

Literature Recommendations:

Rohwer, G. (2015). Using NEPS Data for Comparing Math Competencies at Grades 5 and 7. (NEPS Working Paper No. 60). Bamberg: Leibniz Institute for Educational Trajectories, National Educational Panel Study.

Cornelia Kristen

University of Bamberg, E-mail: cornelia.kristen@uni-bamberg.de

“Language Acquisition of Recently Arrived Immigrants in four European Destinations”

Abstract: This study examines processes of language acquisition among new immigrants from Poland and Turkey in different European destinations focusing on the first few months after arrival. Starting from a human capital framework, a variety of pre- and post-migration conditions of language learning are addressed, including economic and non-economic incentives, the amount of exposure to the destination language as well as learning efficiency. The empirical analyses are based on SCIP data, a two wave panel on new immigrants in Europe. The longitudinal setup allows following the development of language skills over time, taking into account initial skill levels shortly after arrival as well as language acquisition thereafter. The analyses reveal that immigrants from both groups in all destination countries improve their language skills over time. There is also clear evidence that the conditions associated with efficiency, exposure, and incentives matter for language learning. Especially pre-migration exposure in school or other structured learning environments and post-migration exposure in terms of destination language use in various contexts are crucial to acquiring language proficiency. The empirical results apply to Poles and Turks in the different destinations likewise indicating that the processes fostering language acquisition follow a general logic.

Kaplan, David

University of Wisconsin-Madison, USA, E-mail: david.kaplan@wisc.edu

“Workshop on Bayesian Statistics”

Abstract: Bayesian statistics has long been overlooked in the quantitative methods training for education. Typically, the only introduction that a student might have to Bayesian ideas is a brief overview of Bayes' theorem while studying probability in an introductory statistics class. This is not surprising. First, until recently, it was not feasible to conduct statistical modeling from a Bayesian perspective because of its complexity and lack of available software. Second, Bayesian statistics represents a powerful alternative to frequentist (classical) statistics, and is therefore, controversial. Recently, however, there has been great interest in the application of Bayesian statistical methods, mostly due to the availability of powerful (and free) statistical software tools that now make it possible to estimate simple or complex models from a Bayesian perspective.

The orientation of this short course is to introduce practicing education scientists to the basic elements of Bayesian statistics and to show why the Bayesian perspective provides a powerful alternative to the frequentist perspective. It is assumed that

students of the short course will have a background in basic statistical methods up to, and including, regression analysis.

Topics to be covered in this short course are

1. The major differences between the Bayesian and frequentist paradigms of statistics, with particular focus on how uncertainty is characterized.
2. Bayes' theorem
3. Bayesian model building and model evaluation.
4. Bayesian computation
5. An example
6. Wrap-up: Relative advantages of the Bayesian perspective.

Literature Recommendations:

van de Schoot, R., Kaplan, D., Denissen, J., Asendorpf, J. B., Neyer, F. J. & van Aken, M. A. G. (2013). A Gentle Introduction to Bayesian Analysis: Applications to Developmental Research. *Child Development*. DOI: 10.1111/cdev.12169

Kaplan, D. & Depaoli, S. (2013). Bayesian statistical methods. In T. D. Little (ed.), *Oxford Handbook of Quantitative Methods*. (pp 407-437). Oxford: Oxford University Press.

PAPERS BY PHD-STUDENTS

Fischer, Luise

LifBi, Germany, E-mail: luise.fischer@lifbi.de

“Evaluating Link Methods on Rasch Scaled Longitudinal Data in Large Scale Assessments”

Abstract: Measuring growth in an item response theory (IRT) framework requires aligning two tests to a common scale known as vertical linking. Since no ‘best practice’ exists for vertical linking of Rasch scaled longitudinal data in large scale assessments, an empirical study was conducted within the German National Educational Panel Study (NEPS). In order to find appropriate link methods for various competence domains (e. g. mathematics, reading and scientific literacy) the design of the study allows simultaneous comparisons between link designs based either on anchor-items or an anchor-group. Three link methods (mean/mean linking, fixed parameters calibration, concurrent calibration) were selected to be compared and evaluated using the criteria of link error, link result, model fit (AIC, BIC) and influence on ability estimation. Two tests on mathematical competence were administered in Grades 5 and 7 to a longitudinal sample (N=3833). An extra link sample (N=581) was administered both tests at the same time. The assumptions of unidimensionality and measurement invariance were examined and verified using effect based hypothesis testing. Results show that link methods differ in their estimated amount of competence development. However, link method selection has no significant effect on competence development estimation.

Freund, Jan-David

University of Bamberg, Germany, E-mail: jan-david.freund@uni-bamberg.de

“Double Jeopardy - How Risk Factors Lower the Robustness of Maternal Sensitivity in the Face of a Difficult Child Temperament”

Abstract: Quality of children’s early home learning environment, especially the quality of interaction in terms of sensitive and stimulating behavior, is one of the most important and long-lasting predictors of an advantageous child development. However, various study results point to a reduced parental ability to provide high quality interactions, when emotional stress in the family is high. Difficult child temperament could be one potential stressor, but study results remain contradictory showing no relations in large scale studies but strong relations in high risk samples. Therefore we hypothesize, that parents may buffer the negative effect of difficult child temperament when other stressors, like low household income or lack of support of a partner, are not present or low.

We investigated this assumption using data of the representative sample of the first wave of the Early Childhood Cohort of the German National Educational Panel Study (NEPS) which assesses educational factors and early development of 3500 children from 6-8 months of age onward. Quality of parent-child interactions was assessed by coding videos of a semi-structured play situation between parent and child using a macro-analytic rating system. Infant temperament and contextual factors were assessed via parental interview. We defined subgroups which differ in their amount of accumulated risk factors (e.g. low SES, lack of social support, physical well-being of the child), and analyzed the relationship of temperament and the quality of interactions. In accordance with previous findings, only a very small overall relationship could be found. However, as hypothesized, a targeted inspection of subgroups yielded a clearly higher impact of child temperament on mother's sensitive behavior with increasing number of risk factors.

Our findings support the assumption that a difficult temperament poses an additional developmental risk for children who already grow up with health challenges or under difficult circumstances.

Hägglund, Anna Erika

Leibniz University of Hannover, Germany, E-mail: e.haeggglund@ish.uni-hannover.de

“Gender Differences in adolescents’ STEM–aspirations across countries: Why does the gender gap in scientific and technical occupational aspirations vary between countries?”

Abstract: Despite decreasing gender differences in educational attainment, field of study choices continue to differ between men and women, with women being particularly underrepresented in STEM-subjects (Science, Technology, Engineering, and Mathematics). Yet cross-national studies have shown that the male advantage in technical and scientific fields varies across countries, as some countries display larger gender gaps in STEM-subjects than others. To understand how these differences come about, we ascertain an earlier point in the educational biography, focusing on adolescents occupational expectations. Therefore, we address the question why 15 year old girls are more likely to expect to work in a STEM-occupation in some countries than in others.

Based on rational choice approaches, we develop a theoretical framework, explaining how the structure of the labour market and educational system influence girls’ and boys’ STEM-expectations on the individual level. Empirically, the study links individual occupational expectations in 31 European and OECD-countries, drawn from the PISA-2006 study (Programme for International Student Assessment, OECD) to macro level indicators. In addition to collecting data on competencies, the PISA study asked in 2006 which job students expected to have when they were 30 years old. First results of the multi-level models indicate that girls are more likely to develop

STEM-aspirations in countries with a higher female advantage in the educational system and larger health sector.

Hübner, Nicolas

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“Effects of the Upper Secondary School Reform in Thuringia on Achievement and Motivational Outcomes”

Abstract: Over the last decades, there has been growing interest in many western countries to increase the enrolment and performance of students in science and mathematics (Osborne & Dillon, 2008). STEM education is assumed to be an essential foundation to address issues of major socio-political relevance with adequate knowledge and build a prospering competitive economy (Eisenhart et al., 2015; Mullis et al., 1998). Such developments can be understood and analysed in the broader framework of *curricular intensification* (e.g. Domina & Saldana, 2012). In Germany, in order to increase performance in core competence areas (e.g. mathematics), eleven states introduced reforms of upper secondary schools since the beginning of the new millennium. In the current study, effects of one of these reforms of curricular intensification (in Thuringia) on cognitive abilities (e.g. achievement in mathematics, English-reading) and motivational variables (e.g. domain specific self-concept and interest) was investigated in detail.

Using data of the Additional Study Thuringia (Blossfeld, Rossbach, & Maurice, 2011; Wagner et al., 2011), the authors compared data of the last student cohort before ($N = 1,316$) and the first student cohort after ($N = 886$) the reform.

Reform effects were analysed using unidimensional and multidimensional two- and one-parameter logistic item response theory models (IRT) as well as structural equation models. The cluster structure of the data was taken into account by using robust standard errors. Missing data was treated using full information maximum likelihood (FIML). Robustness of results was further investigated (e.g. using models without DIF-items).

Overall, there was no statistically significant effect of the reform on average achievement in STEM subjects. However, we found differential effects in English reading in advantage of boys. On motivational variables, we found increases in English self-concept for boys, whereas the reform had a negative effect on girls' self-concept in mathematics.

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“Do Parents Respond to Ability Peer Effects?”

Abstract: Using NEPS data on students who were followed from grades 5 through 7, this project investigates whether parental support (homework assistance and paid tutoring) responds to changes in average peer achievement. The few related studies show that positive impacts from, for example, increases in teacher quality or school funding are somewhat attenuated by reductions in parental support.

At the beginning of secondary school, fifth-graders are assigned to newly formed classes. Thus, initially, parents know little about their child’s peers. This study builds on the fact that parents need some time to learn about (and, therefore, respond to) peer characteristics. The results support this claim: parental support is insensitive (sensitive) to their child’s relative performance at the fifth (seventh) grade. Interestingly, parental support turns out to be positively related to peer achievement, i.e., children tend to receive more homework assistance and paid tutoring if peers become better.

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“Long Term Effects of Home and Institutional Learning Environment on Vocabulary Acquisition”

Abstract: The effects of family background (socio-economic status, parental education) on vocabulary acquisition before school entry are well documented (Weinert & Ebert, 2013). Recent research revealed that those effects decrease slightly when home learning activities (HLA) and the institutional environment are taken into account (Ebert et al., 2013). However, the effects seem to be larger in international studies (Melhuish et al., 2008). This might be due to methodological reasons. A crucial point among former studies is the operationalization of the HLA and the institutional learning activities (ILA) as reflective constructs, assuming that the measured items are casually dependent on the latent variable. The internal consistency of HLA measures in terms of Cronbach’s alpha, however, is often relatively low (Lambrecht et al., 2016). A possible reason for this is that HLA and ILA are not predicting the items’ values but that the measured items cause the HLA and ILA. If this is the case, HLA and ILA should be operationalized as formative constructs (Jarvis et al., 2003).

In this study we address the following research questions:

- (1) Should HLA and ILA be operationalized as formative or reflective constructs?
- (2) Do family background, HLA and ILA predict vocabulary acquisition?

Data analyses are based on $N=542$ children (Starting Cohort 2 of the NEPS, Blossfeld et al., 2011). Children's vocabulary was assessed at two measurement points, using the PPVT vocabulary test (Roßbach et al., 2005). Families' background and HLA (e.g. frequency of reading, doing crafts) were assessed by standardized parental interviews. Similarly, ILA was assessed interviewing the child's educator.

Structural equation models based on the partial least square approach will be applied for both HLA and ILA as reflective and formative constructs in R with the package *plspm* (Sanchez et al., 2015). The models will be evaluated especially with regard to the different measurement models.

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“Quality and Equity in Mathematics Learning in German Secondary Schools”

Abstract: The research project examines two crucial aspects of educational effectiveness in schools: raising the average level of academic achievement (quality) and attaining a weak association between academic achievement and social background (equity). The goal of the project is to identify factors inside schools, which influence the quality and equity of student learning. The study focuses on mathematics learning in academic track secondary schools in Germany. Independent variables are process factors and structural factors on both class level and school level. Analyses are conducted with data from the German National Educational Panel Study. These data are collected using different methods of measurement, including standardized tests, interviews with parents and questionnaires for teachers and principals. As a method of analysis multilevel modeling is applied. Preliminary results suggest that cognitive activation has a positive effect on quality, while teachercentred teaching has a negative effect. In regard to equity, cognitive activation and group work with heterogenous groups have positive effects.

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“Cross Modal Audiovisual Matching in Language Acquisition in Infants During the First Year of Life”

Abstract: In the context of early language acquisition numerous studies exist, which underline the ability of infants to segment words with the aid of transitional probabilities (TPs) (Goodsitt, Morgan & Kuhl, 1993; Saffran, Aslin & Newport, 1996; Saffran, Newport & Aslin, 1996). Not only in the area of learning words, but also in the field of learning tone sequences (Saffran, Johnson, Aslin, & Newport, 1999) as

well as visual forms (Fiser & Aslin, 2002; Kirkham, Slemmer & Johnson, 2002; Marcovitch & Lewkowicz, 2009; Slone & Johnson, 2015) these TPs play a relevant role. Due to the fact that infants are often exposed to various modalities in their everyday life, particularly in language acquisition, the present research project should face up to the questioning, if infants during the first year of life are able of cross modal learning – each type of learning, which receives information of more than one modality (Skocaj, Leonardis & Kruijff, 2012) - sequential presented audiovisual stimuli in the context of language acquisition. In reference to the phenomenon of *perceptual narrowing*, tendency for infants to maintain or refine perceptual abilities for native attributes, while declining in discriminating non-native attributes (Scott, Pascalis & Nelson, 2007) and the so called *facilitation effect* of native phonetic contrasts between six and twelve months (Kuhl, Stevens, Hayashi, Deguchi, Kiritani & Iverson, 2006) should be examined in a frame of a modified version of the *intersensory matching procedure* (see Pons, Lewkowicz, Soto-Faraco & Sebastian-Galles, 2009), if these results can be replicated with languages out of one classification of rhythm (German and Swedish) and how sensitive infants are towards the linking of geometrical forms with varying TPs in a continuous syllable stream. Furthermore it should be drawn a comparison concerning the correct matching of audiovisual natural (social) and artificial stimuli material. Additionally it should be attached value to the variable of attention, by reading it as a potential moderator variable.

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“Education and Lifetime Income”

Abstract: While a great deal of literature has in the past been concerned with estimating the returns to education (Psacharopoulos & Patrinos, 2004) far less is known about the lifetime perspective of income and education (Schmillen & Stüber, 2014). Focusing on lifetime income is interesting since this means also incorporating periods of unemployment of individuals as well as the opportunity costs while being in education. In this project, the previous human capital literature is expanded by examining whether education has a productivity enhancing effect regardless of being attained in school or during vocational training. By linking National Educational Panel Study (NES) data with administrative social security records age income profiles are constructed. Linking administrative data comes with a number of methodological challenges such as checking whether non-consent of survey respondents to link data is selective or dealing with censored wages in social security data. The latter is overcome by imputing wages above the social security threshold. After having generated the data, the aim of the project is to provide descriptive graphical statistics of age-income profiles for educational groups. A particular focus lies on separating schooling and vocational education to uncover the extent to which lifetime income differs between individuals who have completed the same vocational training degree

but differ in their schooling attainment. We find low returns to an additional year of schooling and interpret this as evidence in favor of heterogeneous human capital where schooling does not necessarily increase work productivity, but may be related to other non-monetary returns such as subjective well-being.

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“Disentangling Interviewer and Area Effects in Large Scale Educational Assessments through Multilevel IRT-Models”

Abstract: A study on adult education conducted by the German National Educational Panel Study (NEPS) is used to investigate interviewer and area effects on the estimation of adult mathematic competence (total N = 5220). Due to the hierarchical nature of the sampling procedure that resulted from a stratified sampling approach respondents were hierarchically nested within different interviewers and also in different geographical regions. An accurate estimation of latent ability must account for these dependencies and thus requires a multilevel modelling technique.

The objectives of this study were threefold. First, area effects were examined by identifying regional characteristics of municipalities within each stratum (i.e., living standards, class affiliation of households in this area and purchasing power) that might explain differences in the estimated latent abilities. Second, dependencies of the latent ability with interviewer characteristics were studied because respondents were not randomly assigned to interviewers by design. Moreover, interviewer effects due to the interviewer’s work experience, gender, age and educational attainment were examined. In comparison to regional effects interviewer effects were expected to be small. Nevertheless, small effects can have an undue impact on the quality of survey data, which increases with the number of respondents assigned to each interviewer (cf. Hox 1994). Hence, it is important that the assumption of independence between interviewer and respondent characteristics holds. Third, it was tested whether the inclusion of additional regional and interviewer information in the background model leads to a more accurate estimation of item parameters and reduced error in ability prediction.

Respondent characteristics in the form of item responses and socio-demographic variables were included on the first level of the multilevel model, whereas area and interviewer characteristics were included on the second level. For the estimation a one-step estimation procedure was applied that simultaneously accounts for missing values in background variables during the estimation of latent competence (cf. Aßmann et al. 2014). The sampling variability and the imputation variance associated with the estimation of latent ability in large scale assessments were investigated. The results will be embedded in a broader discussion on the modelling of latent abilities in large scale educational assessment.

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“Ethnic Classroom Composition: Do Peers Affect Students’ Educational Achievement?”

Abstract: The proportion of ethnic minority students in a classroom can affect individual students’ language-related abilities. While a growing body of research investigates the relationship between ethnic classroom composition and educational performance (see Dumont et al. 2013), the mechanisms underlying such compositional effects have hardly been addressed in empirical analyzes. One of the driving factors may relate to minority language use within ethnic-segregated classrooms (Van Ewijk & Slegers 2010). Minority language use among peers is associated with fewer opportunities for learning the language of instruction (Esser 2006). This may negatively affect minority students’ language competences. In this contribution we test this hypothesized mechanism by investigating if non-German language use among classmates mediates the association between ethnic classroom concentration and language-related achievement. Based on a sample of 12,682 ninth grade students in 732 classrooms in the German education system (NEPS, Blossfeld et al. 2011), we employ multilevel regression models of German reading comprehension performance on the percentage of minority students in class, as well as other relevant individual and compositional characteristics. Our findings indicate that students in classrooms with higher proportions of ethnic minority students reach slightly lower scores on the reading test. This negative association is especially pronounced for individual ethnic minority students. Furthermore, controlling for minority language use with classmates considerably reduces the effect of the ethnic composition. Thus, language use among peers seems to mediate the compositional effects of ethnic classroom concentration on language competences.

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“Identification of DIF-free Items under Complex DIF Con-Figurations”

Abstract: The analysis of competence data in large-scale assessments has gained considerable traction and importance during the recent years. Studies, such as the National Educational Panel Study (NEPS) or the Programme for International Student Assessment (PISA) use competence data for the investigation of group comparisons or competence development over time. In order to ensure that changes and differences in the measurement are directly attributable to changes and differences in the latent construct the scales must be comparable.

The usage of Item-Response Theory (IRT) models allows to view this problem as one of linking parameters. When linking models, the analyst assumes invariant

measurement properties of the items in the two occasions that are supposed to be linked. In IRT, items that show different properties across two groups are said to exhibit differential item functioning (DIF). Various procedures for linking under these circumstances exist. For example, the assumption of no DIF might hold for a subset of items and partial measurement invariance can be accepted. It is thus important to identify items for which measurement invariance can be assumed.

This project investigates recently developed procedures for the identification of differentially functioning items. Anchor selection methods have been proposed that use aggregates of DIF-tests to form a ranking of potential anchor items (Kopf, Strobl & Zeileis, 2015). This ranking can further be used to either select a fixed amount of anchor items or for iterative procedures, where items are included into the anchor until a stopping criterion is met. Additionally, the concept of differential item pair functioning has been introduced by Bechger & Maris (2015) which leverages the only identified information — item parameter differences — to identify clusters of items that conform to a Rasch model across groups. These methods however, have not yet been investigated under conditions of different DIF structures, e.g., when aggregated DIF favors one group over another or more complex variants of DIF configurations, such as multiple clusters.

In order to investigate the performance of the DIF identification methods under these conditions, a simulation study is set up. By varying the aforementioned parameters of DIF configuration systematically, their potential to identify DIF-free items and thus to allow an unbiased linking under these conditions is examined. Additionally, taking the results of the simulation study into account, we will apply them to empirical data from the NEPS reading study in order to link grade 9 students and adults.

The study should advance the knowledge about the DIF identification of items that will ensure a fair comparison in the context of scale linking in IRT models, specifically under arguably more realistic conditions of complex structures of DIF.