

# Individual characteristics of teacher education students

Re-examining the 'negative selection' hypothesis

Julia-Carolin Brachem & Hilde Schaeper  
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## Teachers' individuality and its impact on learning and instruction

- Individual characteristics (cognitive abilities, personality, vocational interests) are considered relevant for
    - teachers' professional competences,
    - successful teaching,
    - the development of students' competences,
    - and student achievement.
- (Klusmann, 2013; Kunter et al., 2011; Roloff Henoch et al., 2015; Rothland, 2014)
- 'Opportunity-use model' (Fend, 2006; Helmke et al., 2007; Zierer & Seel, 2012)
    - Individual prerequisites determine whether and how efficient learning opportunities during teacher education are used.

## The 'negative selection' hypothesis

- The teaching profession attracts people with rather unfavourable cognitive and psychological characteristics (Denzler & Wolter, 2009; Eder et al., 2015; Guarino et al., 2006; Rothland, 2014; Zumwalt & Craig, 2008).
  - Teacher training is perceived less demanding than other study programmes (Mayr & Neuweg, 2009; Retelsdorf & Möller, 2012).
- No proof for a general 'negative selection' when controlling for the teaching degree (Klusmann, 2013; Klusmann et al., 2009; Rothland, 2014) or the field of study (Rolloff Henoch et al., 2015).
- But, a certain 'internal selection' of teacher education students.
  - Candidates for upper secondary education show more favourable characteristics than candidates for primary or lower secondary education (Klusmann, 2013; Klusmann et al., 2009; Rolloff Henoch et al., 2015; Rothland, 2014).

## Previous findings on teachers' individual characteristics

- **Cognitive abilities:** other students > teacher education students  
up. sec. education > prim., low. sec. education  
STEM study major > non-STEM study major
- **Personality:** teacher education > **extraversion**, **openness** > other  
up. sec. > **openness** > prim., low. sec.  
prim., low. sec. > **agreeableness**, **extraversion** > up. sec.  
STEM > **conscientiousness** > non-STEM
- **Vocational interests:** teacher education > **social**, **artistic** > other  
up. sec. > **investigative** > prim., low. sec.  
prim., low. sec. > **social** > up. sec.  
STEM > **investigative**, **realistic** > non-STEM

(Brookhart & Freeman, 1992; Denzler & Wolter, 2009; Eder et al., 2015; Gold & Giesen, 1993; Guarino et al., 2006; Kaub et al., 2012; Klusmann, 2013; Klusmann et al., 2009; König et al., 2013; Neugebauer, 2013; Retelsdorf & Möller, 2012; Roloff Henoch et al., 2015; Rothland, 2014; Watt et al., 2012)

Going beyond existing studies (e.g. Roloff Henoch et al., 2015)

- Analysing a larger sample.
- Differentiating the group of teacher education students.
- Analysing simultaneously teaching degree and field of study.

## Research questions

- 1) Do students' **individual characteristics** (cognitive abilities, personality, vocational interests) have an effect on the choice of a teacher education programme or another **study programme**?
- 2) ... on the choice of a specific **teaching degree** (primary, lower secondary, upper secondary education)?
- 3) ... on the choice of STEM or non-STEM **study majors**?

## Hypotheses

- H1) Students with lower cognitive abilities, pronounced extraversion and openness, and stronger social and artistic interests more often choose **teacher education programmes** instead of other study programmes.
- H2) Students with higher cognitive abilities, pronounced openness, and higher investigative interests more often choose a **teaching degree for upper secondary education** than for primary or lower secondary education.
- H3) Regardless of the chosen study programme, students with higher cognitive abilities, pronounced conscientiousness, and stronger investigative and realistic interests more often choose **STEM study majors**.

## Data

- German National Educational Panel Study (NEPS) (Maurice et al., 2016) Starting Cohort First-Year Students (doi:10.5157/NEPS:SC5:9.0.0).
- State-wide random sample of new entrants to German higher education institutions in the winter term 2010 (Aschinger et al., 2011).
- Oversampling of teacher education students.

## Sample

	<b>STEM</b>	<b>Non-STEM</b>	<b>Total</b>
<b>Primary education</b>	304	835	1,139
<b>Lower secondary education</b>	427	621	1,048
<b>Upper secondary education</b>	1,146	1,999	3,145
<b>Other university students</b>	1,239	2,587	3,826
<b>Total</b>	<b>3,116</b>	<b>6,042</b>	<b>9,158</b>

## Analysis

- Multinomial logistic regression
  - Estimating the effect of individual characteristics and socio-demographic factors (*control*) on the probability of being enrolled in different study contexts.
  - Separate estimations for students with/without at least one STEM major.
  - Coefficients reported: Odds ratios
    - OR < 1 (decrease of the odds)
    - OR ~ 1 (no effect)
    - OR > 1 (increase of the odds)
- Multiple imputation (m=50)
  - Complete Cases: 1,600 (17,47 %)
  - Missings: Up to 64 % (reading and maths competences), 25 % (Big Five)
  - Diagnostics: Comparison of distributions of observed/imputed variables.



## Measures ('individual characteristics')

- Cognitive ability
  - School leaving grade
  - Competence measures: reading, maths
- Personality
  - 'Big Five':  
Extraversion, Agreeableness, Conscientiousness, Neuroticism, Openness
- Vocational interests
  - 'RIASEC':  
Realistic, Investigative, Artistic, Social, Enterprising, Conventional

## Cognitive abilities

- teacher education students vs. other students ('external')

	STEM			Non-STEM		
	Prim. / Other	Low. sec. / Other	Up. sec. / Other	Prim. / Other	Low. sec. / Other	Up. sec. / Other
<b>School leaving grade</b>	1.43*	3.51***	.93	1.03	3.03***	.85*
<b>Reading competence</b>	1.22	1.13	1.02	1.09	1.01	1.03
<b>Maths competence</b>	.74*	.77**	.90	.94	.87*	.90*
<b>Pseudo R<sup>2</sup> (McFadden)</b>		.21			.09	
<b>RVI / FMI</b>		.13 / .58			.15 / .67	

\*p<.05 \*\*p<.01 \*\*\*p<.001

Base category: other university students

Controlled for: gender, migration background, academic family background, personality, interests

## Cognitive abilities

- primary vs. lower secondary vs. upper secondary education ('internal')

	STEM			Non-STEM		
	Prim. / Low. sec.	Prim. / Up. sec.	Low. sec. / Up. sec.	Prim. / Low sec.	Prim. / Up. sec.	Low. sec. / Up. sec.
<b>School leaving grade</b>	.41***	1.54**	3.75***	.34***	1.21*	3.55***
<b>Reading competence</b>	1.08	1.19	1.11	1.08	1.06	.98
<b>Maths competence</b>	.96	.82	.85	1.08	1.04	.97
<b>Pseudo R<sup>2</sup> (McFadden)</b>		.21			.09	
<b>RVI / FMI</b>		.13 / .58			.15 / .67	

\*p<.05 \*\*p<.01 \*\*\*p<.001

Base categories: Low. sec. / Up. sec.

Controlled for: gender, migration background, academic family background, personality, interests

## Personality

- teacher education students vs. other students ('external')

	STEM			Non-STEM		
	Prim. / Other	Low. sec. / Other	Up. sec. / Other	Prim. / Other	Low. sec. / Other	Up. sec. / Other
<b>Extraversion</b>	.94	.87	1.06	1.22	.89	.94
<b>Agreeableness</b>	1.30	1.17	1.16	1.11	1.11	1.05
<b>Conscientiousness</b>	1.00	.83	.99	.86	.89	.97
<b>Neuroticism</b>	.85	.73*	.84	.94	.90	.86*
<b>Openness</b>	1.02	1.09	1.20*	1.07	1.11	1.16*
<b>Pseudo R<sup>2</sup> (McFadden)</b>		.21			.09	
<b>RVI / FMI</b>		.13 / .58			.15 / .67	

\*p<.05 \*\*p<.01 \*\*\*p<.001

Base category: other university students

Controlled for: gender, migration background, academic family background, cognitive abilities, interests

## Personality

- primary vs. lower secondary vs. upper secondary education ('internal')

	STEM			Non-STEM		
	Prim. / Low. sec.	Prim. / Up. sec.	Low. sec. / Up. sec.	Prim. / Low sec.	Prim. / Up. sec.	Low. sec. / Up. sec.
<b>Extraversion</b>	1.08	.89	.82	1.37*	1.30*	.94
<b>Agreeableness</b>	1.11	1.12	1.01	1.00	1.06	1.05
<b>Conscientiousness</b>	1.21	1.01	.83	.97	.89	.92
<b>Neuroticism</b>	1.16	1.01	.87	1.04	1.09	1.05
<b>Openness</b>	.94	.86	.91	.96	.92	.96
<b>Pseudo R<sup>2</sup> (McFadden)</b>		.21			.09	
<b>RVI / FMI</b>		.13 / .58			.15 / .67	

\*p<.05 \*\*p<.01 \*\*\*p<.001

Base categories: Low. sec. / Up. sec.

Controlled for: gender, migration background, academic family background, cognitive abilities, interests

## Vocational interests

- teacher education students vs. other students ('external')

	STEM			Non-STEM		
	Prim. / Other	Low. sec. / Other	Up. sec. / Other	Prim. / Other	Low. sec. / Other	Up. sec. / Other
<b>Realistic</b>	.95	.99	1.06	1.28***	1.40***	1.17***
<b>Investigative</b>	.30***	.35***	.50***	.61***	.62***	.66***
<b>Artistic</b>	1.45***	1.25**	1.26***	1.06	1.05	1.15***
<b>Social</b>	5.33***	3.50***	1.30***	3.23***	1.89***	1.51***
<b>Enterprising</b>	1.19	1.77***	1.96***	.85*	1.13	1.34***
<b>Conventional</b>	1.25*	1.37**	1.24**	1.47***	1.60***	1.47***
<b>Pseudo R<sup>2</sup> (McFadden)</b>		.21			.09	
<b>RVI / FMI</b>		.13 / .58			.15 / .67	

\*p<.05 \*\*p<.01 \*\*\*p<.001

Base category: other university students

Controlled for: gender, migration background, academic family background, cognitive abilities, personality

## Vocational interests

- primary vs. lower secondary vs. upper secondary education ('internal')

	STEM			Non-STEM		
	Prim. / Low. sec.	Prim. / Up. sec.	Low. sec. / Up. sec.	Prim. / Low sec.	Prim. / Up. sec.	Low. sec. / Up. sec.
<b>Realistic</b>	.96	.89	.93	.92	1.09	1.19**
<b>Investigative</b>	.84	.60***	.71***	.98	.92	.93
<b>Artistic</b>	1.15	1.15	1.00	1.01	.93	.91
<b>Social</b>	1.53**	2.32***	1.52***	1.71***	2.14***	1.26**
<b>Enterprising</b>	.67**	.61***	.90	.76**	.64***	.84*
<b>Conventional</b>	.91	1.00	1.10	.92	1.00	1.08
<b>Pseudo R<sup>2</sup> (McFadden)</b>		.21			.09	
<b>RVI / FMI</b>		.13 / .58			.15 / .67	

\*p<.05 \*\*p<.01 \*\*\*p<.001

Base categories: Low. sec. / Up. sec.

Controlled for: gender, migration background, academic family background, cognitive abilities, personality

## STEM study major

	<b>Prim. / Non-STEM</b>	<b>Low. sec. / Non-STEM</b>	<b>Up. sec. / Non-STEM</b>	<b>Other / Non-STEM</b>
<b>School leaving grade</b>	1.22	.96	.74**	1.10
<b>Reading competence</b>	.80	.78	.68***	.72***
<b>Maths competence</b>	1.82***	2.06***	2.23***	2.09***
<b>Realistic</b>	1.11	1.01	1.52***	1.62***
<b>Investigative</b>	1.94***	2.38***	3.15***	4.98***
<b>Artistic</b>	.63***	.59***	.51***	.48***
<b>Social</b>	.68**	.85	.77**	.47***
<b>Enterprising</b>	.77*	.83	.79**	.64***
<b>Conventional</b>	1.10	1.11	1.05	1.21**
<b>Pseudo R<sup>2</sup> (McFadden)</b>	.13	.19	.32	.49
<b>RVI / FMI</b>	.15 / .45	.20 / .52	.27 / .56	.22 / .53

\*p<.05 \*\*p<.01 \*\*\*p<.001

Base category: Non-STEM

Controlled for: gender, migration background, academic family background, personality



- **Cognitive abilities:** 'Negative selection' into lower secondary teacher education.
- **Personality:** Only small effects (extraversion, openness) when controlling for cognitive abilities and interests.
- **Vocational interests:** Strong effects, especially regarding investigative and social interests.
- **STEM study major:** Partly predicted by cognitive abilities (maths) and vocational interests (investigative, social).
- **Hypotheses:** Mainly confirmed ( $\sim$  personality).
- **Conclusion:** Individual characteristics have differential effects on career choice. There is no general 'negative selection' into teacher education when controlling for teaching degrees and study majors.

**Need to take into account teacher candidates' heterogeneity!**

Thanks for your interest!

Questions?

Comments?

Julia-Carolin Brachem  
Email: [brachem@dzhw.eu](mailto:brachem@dzhw.eu)

Hilde Schaeper  
Email: [schaeper@dzhw.eu](mailto:schaeper@dzhw.eu)

German Centre for Higher Education Research and Science Studies (DZHW)  
Lange Laube 12, 30159 Hannover, Germany

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