International Journal of Inclusive Education

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tied20

The impact of special education resources and the general and the special education teacher's competence on pupil mathematical achievement gain in inclusive classrooms

Elisabeth Moser Opitz, Susanne Schnepel, Helena Krähenmann, Sarah Jandl, Franziska Felder & Rachel Sermier Dessemontet

INTERNATIONAL JOURNAL OF INCLUSIVE EDUCATION
https://doi.org/10.1080/13603116.2020.1821451

The impact of special education resources and the general and the special education teacher's competence on pupil mathematical achievement gain in inclusive classrooms

Elisabeth Moser Opitz[a*], Susanne Schnepel[a*], Helena Krähenmann[a], Sarah Jandl[a], Franziska Felder[a] and Rachel Sermier Dessemontet[b]

[a]Institute of Education, University of Zurich, Zurich, Switzerland; [b]Department of Special Educational Needs, University of Teacher Education in the State of Vaud, Lausanne, Switzerland

ABSTRACT

Research in inclusive settings is complicated by the nested relationships between the general education teacher (GET), the special education teacher (SET) and pupils. In this study, the impact of SET resource and selected variables of teacher competence (professional mathematical knowledge SET, attitude towards inclusion GET, classroom management GET) on the mathematical achievement gain of typically developing pupils (TYP) and pupils with intellectual disability (ID) was examined. Mathematical achievement was tested at the beginning of the school year (t1) and the end (t2) in 34 inclusive classrooms (sample ID: $n = 42$; sample TYP $n = 525$). IQ and gender – and the average mathematical achievement at class level in the sample TYP – were included as control variables. For pupils with ID, hierarchical regression modelling revealed that the mathematical knowledge at t1 explained most of the variance in mathematical achievement gain. For the group TYP, the results of a multi-level analysis showed that mathematical knowledge at t1, IQ and the average mathematical achievement at class level all had a positive effect on mathematical achievement gain. The more hours a SET was present in the classroom, the more the mathematical achievement of the group TYP increased. The other teacher competence variables had no apparent impact.

ARTICLE HISTORY
Received 26 November 2019
Accepted 17 June 2020

KEYWORDS
Inclusive education; special education resources; funding model; teacher competence; attitudes towards inclusion

Introduction

Although the implementation of inclusive education is a tenet of educational policy in many countries, there is little research into the impact of teacher related variables on pupils (e.g. social participation, motivation, achievement) in inclusive classrooms. It is very important to evaluate the impact of these variables since it is known from research in regular classrooms that teacher related variables are a key to achieving the best

CONTACT Elisabeth Moser Opitz elisabeth.moseropitz@uzh.ch Institute of Education, University of Zurich, Freiestrasse 36, 8032, Zurich, Switzerland
*Elisabeth Moser Opitz and Susanne Schnepel contributed equally to this study.

possible outcomes for pupils (Hattie 2009). Research on regular classrooms has shown that teacher competence on different levels – cognitive and affect-motivation dispositions as well as the concrete teacher behaviour – affects pupils (Blömeke, Gustafsson, and Shavelson 2015).

It is often assumed that other, more specific, factors may be significant in inclusive education: The number of hours a special education teacher (SET) is present in a classroom (SET resource; e.g. Bottge, Cohen, and Choi 2017; Malki and Einat 2018); the SET competence (e.g. Pit-ten Cate et al. 2018); and the attitude of the general education teacher (GET) towards inclusive education (e.g. De Boer, Pijl, and Minnaert 2011; Desombre, Lamotte, and Jury 2019; Jordan, Glenn, and McGhie-Richmond 2010). However, longitudinal studies that assess these assumptions are lacking, especially for SET competence and the attitude of the GET towards inclusive education.

Studying the impact of teacher related variables on pupils in inclusive settings is particularly challenging due to the complicated 'nested instruction' structure (Jones and Brownell 2014): Pupils with special educational needs (SEN) in inclusive classrooms – and sometimes also their classmates – are taught by a GET and a SET. These professionals have had different training and different professional experiences, and therefore have different competences, attitudes and responsibilities, and they spend a variable amount of time with each pupil. This means that these different professional profiles have to be considered when investigating teacher related variables in inclusive classrooms.

This longitudinal study aims to contribute to closing this research gap. It takes into account the challenge of nested instruction and examines the impact of SET resource and selected aspects of the teacher competence of the GET and the SET on the mathematical achievement gain of pupils with and without intellectual disability (ID) in inclusive classrooms. The focus is on mathematics because most research on the impact of teacher related variables on pupils from general education focuses on mathematical learning. Inclusive classrooms, those with pupils with and without ID, are particularly interesting because pupil mathematical achievement covers a wide spectrum in these classes and there is usually a high level of SET resource.

Impact of SET resources on pupils

Resources are a crucial aspect of inclusive instruction (e.g. Banks, Frawley, and McCoy 2015; Becker 2016), and a lack of resources is criticised as a barrier which hinders the implementation of inclusive education (e.g. Becker 2016; Goldan 2019). Resource in the context of inclusive education is often operationalised as the number of hours of support by a SET or an additional professional in the classroom. In a study by Malki and Einat (2018), 87% of the SETs maintained that inclusive instruction had failed because of insufficient SET resource. Different models for funding this support have to be considered. Meijer (1999) distinguishes three special education funding models. In the input funding model, resources are allocated based on the specific needs of individual pupils. This implies that the needs are assessed, and pupils are labelled. The throughput funding model is based on population indicators (e.g. number of pupils enrolled in a school). A lump sum is given to a school (or a region), and the school provides specific services, like the SET resource. Finally, the output funding model is oriented to the output regarding specific aspirations or aims (e.g. output of the pupils or reducing the number of pupils with SEN).

There has not much been much research on the impact of SET resource on pupil achievement. Bless (2007) compared the achievement gain (in mathematics and language) of low achievers in inclusive classrooms, with and without special education support. He found that pupils in classrooms where special education support was offered made significantly more progress than pupils without such support. Findings from Bottge, Cohen, and Choi (2017) showed that students with disabilities who were provided with more SET support scored higher than similar students who had received only limited support.

However, if and to what extent these resources affect the achievement gain of pupils with ID and their classmates has not yet been studied by controlling for other teacher related variables and for the characteristics of the pupils. Based on the current research, it is assumed that SET resources positively affect pupil achievement gain.

Impact of teacher competence on pupils

Blömeke, Gustafsson, and Shavelson (2015) model teacher competence as a process that includes cognitive and affect-motivation dispositions that have an impact on situation-specific skills (perception, interpretation and decision making) and concrete teacher behaviour, which then affects the pupils and their achievement. According to Pajares (1992) dispositions play a key role in knowledge interpretation and cognitive monitoring. For regular classrooms, the cognitive disposition 'professional knowledge of mathematics education' (e.g. Hill, Rowan, and Ball 2005; Kunter et al. 2013) and affect-motivation dispositions, such as beliefs, have been shown to be important for the mathematical achievement gain of the pupils (e.g. Kunter et al. 2013). For inclusive classrooms, the cognitive disposition 'professional mathematical knowledge of the SET' is also assumed to be crucial (e.g. Jandl and Moser Opitz 2017), but empirical evidence is lacking. For affect-motivation dispositions, only non-specific assumptions about the possible impact of the attitude towards inclusion of the GET are available (e.g. De Boer, Pijl, and Minnaert 2011; Desombre, Lamotte, and Jury 2019; Jordan, Glenn, and McGhie-Richmond 2010).

Looking at teacher behaviour as a further factor of teacher competence, the meta-analysis of Hattie (2009) revealed that classroom management is a core component of successful teacher practices, and studies show that efficient classroom management has a positive effect on pupil mathematical achievement in regular classrooms (e.g. Korpershoek et al. 2016; Kunter et al. 2013). It can also be assumed that classroom management is very important in inclusive education (Jordan and McGhie-Richmond 2014), because these classes are often attended by pupils with behaviour problems and/or learning difficulties (Soodak and McCarthy 2006).

The following section discusses those aspects of the teacher competence of the GET and the SET that are regarded as essential for successfully managing the unique circumstances of inclusive instruction.

Attitude of the teachers towards inclusive instruction

Focusing on affect-motivation dispositions of the teachers in inclusive classrooms, the GET having a positive attitude towards inclusion is deemed to be crucial for the successful implementation of inclusive education (e.g. De Boer, Pijl, and Minnaert 2011; Desombre, Lamotte, and Jury 2019; Jordan, Glenn, and McGhie-Richmond 2010). SETs' attitudes towards inclusion are seldom investigated because SETs voluntarily choose to work with pupils with special educational needs in inclusive classrooms. Empirical evidence shows that their views on inclusion are more positive than those of GETs (Desombre, Lamotte, and Jury 2019; Gebhardt et al. 2011; Saloviita 2019; Wilson, Marks Woolfson, and Durkin 2019). Therefore, the SETs' attitudes towards inclusion will not be considered in this study.

However, existing research does little to establish what benefit the GET having a positive attitude towards inclusion has on pupil variables (e.g. benefits for social inclusion, achievement gain). The few relevant studies have only examined the relationship between attitude towards inclusion and other teacher related variables. Some studies have found a relationship between attitude and self-efficacy (e.g. Avramidis et al. 2019; Bosse et al. 2016). Avramidis et al. (2019) showed that teachers' attitudes towards inclusion and their self-efficacy for inclusive practices predicted their willingness to implement a peer-tutoring programme. Research by Wilson, Marks Woolfson, and Durkin (2019) revealed a positive relationship between the attitude of the teachers and their self-reported teaching practices. It therefore follows that a positive attitude towards inclusive education as a specific affect-motivation disposition influences teaching practices, which, in turn, probably have an impact on pupil achievement gain, as predicted by the model of Blömeke, Gustafsson, and Shavelson (2015). This study gathers initial data on the possible relationship of GETs' attitudes towards inclusion and pupils' mathematical learning gains.

Professional mathematical knowledge of the SET

Research on general education indicates that cognitive dispositions such as the teacher's understanding of a particular subject area in mathematics (e.g. arithmetic or the development of number concept) and the ability to analyse the work of pupils (e.g. knowledge of suitable learning strategies), are crucial for the mathematical achievement gain of pupils (e.g. Hill, Rowan, and Ball 2005; Kunter et al. 2013). This might be especially important in inclusive classrooms due to the special educational needs of some pupils. But little is known about the professional mathematical knowledge of a trained SET and its impact on pupils. It is assumed that these teachers have a particular expertise in supporting pupils in their mathematical learning process compared to GETs. Feng and Sass (2013) found higher achievement gains in pupils in special education classes when their teacher held a post-graduate degree in special education. Research by Jandl and Moser Opitz (2017) confirmed that teachers with an additional degree in special education had better professional mathematical knowledge compared to teachers without a special education degree. The study did not examine, however, if this knowledge influenced the mathematical achievement gain of the pupils.

Based on these research findings it can be hypothesised that the specific expertise of the SET is particularly important for the mathematical achievement gain of the pupil and might also affect pupils without ID, when the SET works in the classroom on a regular basis.

Classroom management

Effective classroom management is an important aspect of successful teacher behaviour and aims to enhance pupil learning time (Kunter and Voss 2013). This is also true in inclusive classrooms (e.g. Jordan and McGhie-Richmond 2014). Time can be efficiently managed when teachers know what is going on in the classroom at all times, monitor what is happening, and intervene when necessary (Kounin 2007). Helmke (2014) listed three factors for effective classroom management:

(1) clear rules and the early establishment and consistent realisation of social and academic norms
(2) successful time management which facilitates the smooth transition from one activity to the next and prevents tardiness and unnecessary waiting
(3) the effective prevention and handling of classroom disruptions.

Soodak and McCarthy (2006) describe the positive effects of teacher-directed strategies, such as scaffolding, on pupils' achievement in inclusive classes. However, longitudinal studies on the impact of classroom management on pupil achievement in inclusive classrooms are not available. On the basis of this existing research, it is hypothesised that effective classroom management by the GET has an impact on the mathematical learning gains of pupils in inclusive classrooms because he or she is responsible for the classroom teaching and spends more time with the class than the SET.

Aims of the study and research questions

The research review reveals that there is scarce empirical evidence demonstrating which teacher related variables might have an impact on pupils' mathematical achievement gain in inclusive classrooms, rather there are many generalised assumptions. The little research that has been conducted in inclusive settings does not consider the different roles and responsibilities of the SET and the GET. This study aims to examine the impact of SET resource and selected aspects of the competence of the SET and the GET on the mathematical achievement gain of pupils with ID and typically developing pupils in the nested instruction environment. This will be done by including two specific variables for the GET (attitude towards inclusion, classroom management), and two for the SET (professional mathematical knowledge, resource). Individual pupil characteristics (prior mathematical achievement, IQ, gender) will be inserted as control variables. In addition, the average mathematical achievement of the class will be considered, because research shows that class composition affects the mathematical achievement of the individual pupils (e.g. Marsh, Kong, and Hau 2000). The following research question will be answered:

To what extent do SET resource, the professional mathematical knowledge of the SET, the GET's attitude towards inclusive instruction and the classroom management skills of the GET have an impact on the mathematical achievement gain of pupils with and without ID?

The following parameters will be examined:

- SET Resource: It is expected that the greater the SET resource, the greater the pupils' mathematical achievement gains.
- Competence SET, professional mathematical knowledge: It is hypothesised that the greater the specific expertise of the SET, the greater the mathematical achievement gain of the pupils.

- Competence GET, attitude towards inclusive instruction: It is expected that the more positive the attitude towards inclusion of the GET, the greater the mathematical achievement gain of the pupils.
- Competence GET, classroom management: It is hypothesised that the better the classroom management skills of the GET, the greater the pupils' mathematical achievement gains.

Method

Context of the study and funding model

In Switzerland, pupils with milder learning disabilities and behaviour disorders always attend a neighbourhood public school without having an official SEN designation. Special education resources for these pupils are (mostly) distributed based on the throughput model, depend on cantonal regulations and are heterogeneous. Only pupils with more severe SEN (e.g. severe learning disability, autism spectrum disorder, intellectual disability) are given SEN diagnoses. These students attend inclusive classes in the public school in their neighbourhood or special schools. For these pupils, special education resources are allocated based on the input model (ca. 6–10 h per week per pupil) and depend on their individual needs as determined by the diagnosis of a school psychologist.

Participants

Thirty-four inclusive classes from grade 1 to grade 3 (6-to-9-year old pupils; $N = 567$) from two linguistic regions participated in the study. Invitation letters were sent to several schools and teachers decided voluntarily whether or not they wished to participate. All parents gave written consent for the participation of their children in the study. Eight classes were combination classes (e.g. grades 1–3 or grades 1 and 2). Pupils with milder learning disabilities and behaviour disorders, without SEN diagnoses, were enrolled in these classes. In addition, each class was attended at least by one pupil with ID. ID was officially diagnosed by a school psychologist prior to the study. At the time of data collection, the cut-off criteria for ID was set at an IQ of 75, which is not in accordance with the ICD-10 criteria (IQ < 70). IQ ranged from 42 to 75. Twelve pupils had an IQ ≥ 70 and $\leq$ 75 and therefore can be considered as pupils with severe learning disabilities.

In the study sample, the average number of SET resource in mathematics lessons per week was 3.55 ($SD = 1.08$), with a minimum of 1.5 h and a maximum of 5 h. In 7 classes, the special education teacher was present in all mathematics lessons (on average 4–5 h per week). In 17 classrooms, pupils with ID were always supported in the classrooms and in 5 classes, the support was given exclusively in a resource room. For the remaining 12 classrooms, a mixed setting was chosen (in-class support and one-to-one support outside the classroom, or in-class-support combined with small group support of pupils with and without ID).

Procedures and measures

The study was conducted over one school year. Pupil mathematical achievement t1 and IQ were tested at the beginning of the school year (September), mathematics achievement t2 at the end (June). The teacher questionnaires on attitude towards inclusion (GET) and professional mathematical knowledge (SET) were administered at the beginning of the school year, the questionnaire on SET resource, 6 months later. Information on classroom management was gathered before Christmas by videotaping one mathematics lesson.

Mathematical achievement

In Switzerland, standardised tests were only available for the end of grade 2 and grade 3. Therefore, for the beginning of grade 1, the end of grade 1, and the beginning of grade 2, author-developed tests were used. These tests are being prepared for standardisation and publication in the same series as those used for grades 2 and 3 (Moser Opitz et al. 2019, 2020). All of the tests evaluate whether the pupils have learned the basics of arithmetical understanding. Consecutive tests (e.g. beginning grade 2, end grade 2) always include a few similar items ('anchor items'). Rasch analyses and DIF-analyses (Bond and Fox 2001) were carried out to assess the quality of the test and measurement invariance across linguistic regions, if the sample and the group size was large enough.

All tests were pencil and paper tests. The test at the beginning of grade 1 was carried out in groups of 4–6 children, the other tests with the whole class.

- Beginning of grade 1: 31 items, ($n = 61$, Cronbach's Alpha = .87). Topics: Counting objects, comparing numbers up to 20, number sequence up to 20, number decomposition, addition with pictures and coins, formal addition, and formal subtraction. Rasch analyses and measurement invariance across the linguistic regions could not be tested ($n = .61$). However, in a sample of $N = 1057$ in another study (publication in preparation), the Mean-square score (MNSQ) of the items was acceptable (0.76–1.25; Smith and Smith 2004).
- End of grade 1/ beginning of grade 2: 24 items ($n = 399$, Cronbach's Alpha = .91). Topics: Counting by steps, number decomposition, doubling, addition, subtraction, and word problems. The item fit was acceptable (0.85–1.29; Smith and Smith 2004). Measurement invariance across the linguistic regions was given (DIF-analyses, criteria DIF $p < .05$ and a difference of parameter < 0.638; Paek and Wilson 2011). This tests correlates strongly with the test at the beginning of grade 1 ($r = .71$, $p < .001$).
- End of grade 2/ beginning of grade 3: standardised test BASIS-MATH-G 2^{+} (Moser Opitz et al. 2020) with 26 Items ($n = 455$, Cronbach's Alpha = .89). The item fit was acceptable (0.86–1.24; Smith and Smith 2004). Measurement invariance across linguistic regions was not given for four items. However, these items were always part of a series of similar items without DIF (e.g. DIF was found for doubling 15, but not for doubling 36 and 49). Therefore, it was decided to neglect these differences. This test correlates strongly with the test at the beginning of grade 2 ($r = .70$, $p < .001$).
- End of grade 3: Standardised test BASIS-MATH $G3^{+}$ (Moser Opitz et al. 2019) with 28 items ($n = 120$, Cronbach's Alpha = .84), which correlates highly ($r = .77$, $p < .001$) with BASIS-MATH-G 2^{+} according to the test manual (ibid.). The item fit was acceptable (0.81–1.15; Smith and Smith 2004). Measurement invariance across linguistic regions could not be tested due to the small group size ($n = 28$) of French speaking children.
- $\text{Sample}^{\text{ID}}$: Adapted version of the test TEDI-MATH test (Kaufmann et al. 2009) with 95 items ($n = 42$, Cronbach's Alpha = .98.) for t1 and t2. Subtests which require a high level of language competence were omitted.

Cognitive ability

In the sample^{TYP}, cognitive abilities were assessed as a control variable with the culture fair test CFT 1-R (Weiß and Osterland 2013). The participants with ID had been diagnosed prior to the study by a school psychologist who had conducted an IQ test, and the scores of these tests were retrieved from the school records. In cases in which this score was not available, pupils completed a CFT 1-R or SON-R (Tellegen, Laros, and Petermann 2007) for an in-depth examination.

Variables on teacher level

- Resources SET: The teachers (SET and GET together) reported, by answering a questionnaire, how many hours the SET was present in the class in total and in specifically in the mathematics lessons. In addition, information on the type of support (in-class support, resource room) was gathered.
- Attitude of the GET towards inclusion: Questionnaire Opinion Relative to Integration ORI (Antonak and Larrivee 1995; 25 Items; adapted for students with ID, e.g. 'Students with ID are likely to create confusion in the regular classroom', Cronbach's Alpha = .86).
- Classroom management: One mathematics lesson per class where the GET and the SET taught in different variations of co-teaching was videotaped with two cameras. Classroom management was assessed in a rating process using two variables: Time management and the consistent implementation of clear rules. Each variable was defined and rated by indicators using a Likert-like scale: 4, full compliance with the ideal performance, 3, rather good compliance, 2, a little compliance, and 1, no compliance. These ratings describe an overall evaluation of the whole lesson that is based on the intensity or degree of the shown behaviour (Rakoczy and Pauli 2006). Indicators for time management were, for example, 'time is used for instructional and content-based activities' or 'the transition of one lesson phase to the next proceeds smoothly'. Indicators for the implementation of clear rules were, for example, 'the GET ensures that the students obey the rules' or 'the GET draws the attention of the pupils to rule violations'. Each video was independently rated by two trained raters. Interrater reliability $g_{relativ}$ was .86 for the variable 'clear rules', and .88 for 'time management'.
- Professional mathematical knowledge SET: Knowledge test (Jandl and Moser Opitz 2017; 24 items: e.g. detection errors of a child reciting the number sequence, assessing the suitability of selected manipulatives), Cronbach's Alpha = .81.

Table 1 gives an overview of the descriptive statistics of teacher related variables.

Table 1. Descriptive statistics of teacher related variables.

Variable	min – max	*M* (SD)
Collaboration GET and SET	3.85–6.00	5.30 (0.46)
Attitude GET	73–130	101.50 (12.76)
Classroom management GET		
Time management	1–4	2.46 (0.75)
Consistent rules	1.5–4	3.12 (0.80)
Knowledge SET	8–29	18.71 (5.46)
Resource SET	1.5–5	3.47 (1.07)

Analyses

The sample with pupils without ID (typically developing pupils, sample^{TYP}, $n = 525$), and the sample with pupils with ID (sample^{ID}, $n = 42$; Table 2) were studied separately for the following reasons. First, the pupils with ID carried out a different math test and followed a separate curriculum from the typically developing pupils. Second, the teaching setting was different for the students with ID. Third, there were only 1–3 pupils with ID per class.

Sample^{ID}: Due to the small sample size, a series of hierarchical regression analyses was carried out with mathematical achievement at t2 as the dependent variable. It was postulated that individual characteristics would be particularly important in this sample, therefore IQ was inserted as the first step, followed by mathematical achievement at t1 in the second step. In step 3, SET resource was put into the model, since pupils with ID are often taught by the SET and benefit from this instruction.

In the following steps, GET's attitude towards inclusion, GET's classroom management, and the professional knowledge of the SET were inserted as variables. The assumptions of multicollinearity and autocorrelation were not violated.

Sample^{TYP}: Due to the hierarchical structure of the data, with pupils nested within classes, multilevel analyses were carried out. The analyses were conducted using R package multilevel 2.6 and lme4 1.1–21 (Bliese 2016) to predict the mathematical achievement at t2. The ICC = 0.208 of the intercept-only model with math t2 indicated that 20.8% of differences in math t2 are explained by differences between classes. The IQ scores were grand mean centred. Math t1 was centred at the group mean (classes) because of large achievement differences between classes.

Mathematical achievement t1, IQ and gender were put into the model as predictors on the individual level. Due to the small number of classes, only three predictors could be included on level 2. Those variables which, based on the current body of research, are likely to predict mathematical achievement were included first: The average mathematical achievement of the class (model 1) and SET resource (model 2). In model 3a–3d, an additional variable was inserted. In model 3a, the attitude of the GET was included. In model 3b, the variable attitude was replaced by consistent rules and in model 3c, by time management. In model 3d, the third variable was the professional knowledge of the SET. Model improvement was calculated with ANOVA. Random intercept models with predictors on level 1 and level 2 fit the data best.

Table 2. Descriptive characteristics of the sample of typically developing pupils for each grade and of pupils with ID.

	Grade 1 *n* (%)	Grade 2 *n* (%)	Grade 3 *n* (%)	Pupils without ID	Pupils with ID *n* (%)
Pupils	70	329	126	525	42
Sex					
Male	36 (51.4)	166 (51.99)	58 (46.4)	260	25
Female	34 (48.6)	154 (46.8)	67 (53.3)	255	17
Language					
German/French	21 (30.0)	227 (69.0)	56 (44.4)	304	23
Other	10 (14.3)	93 (28.3)	21 (16.7)	124	16
Missing	39 (55.7)	9 (2.7)	49 (38.9)	97	3
Linguistic region					
German	40 (57.1)	185 (56.2)	98 (77.8)	323	27
French	30 (42.9)	144 (43.8)	28 (22.2)	202	13

Results

Descriptives

Table 3 gives an overview of the descriptive statistics of the sample.

The high standard deviation of the math scores of the pupils with ID indicate high inter-individual differences in their achievement.

Pupils with ID: regression analyses

Table 4 gives an overview of the results of the regression analysis for the sample^{ID}.

Including IQ in a first step in the model led to $R^2 = .31$ ($p > .05$, $f = 0.66$), but the significance level was missed when math t1 was put into the model, and the proportion of explained variance increased significantly to $R^2 = .84$ ($\Delta F = 123.85$, $p < .001$) with a very high effect size ($f = 2.29$, Cohen 1969). All other variables were excluded from the model because no variance was explained by inserting them. Therefore, the hypotheses on the impact of the GET's attitude towards inclusion and classroom management skills and the impact of the SET's professional knowledge had to be rejected. However, the variable SET resource led to a narrowly missed significance threshold ($p = .078$) with a negative Beta-coefficient ($\beta = -.12$), which contradicts the hypothesis of a positive impact of the SET resource on the mathematical achievement gain of the pupils with ID.

Sample^{TYP}: multilevel model

In all models, on the individual level, mathematical achievement at t1, IQ and gender had a significant and stable impact on mathematical achievement gain (Table 5).

Math t1 ($\beta = .52$, $SE = 0.04$, $p < .001$), IQ ($\beta = 0.02$, $SE = 0.00$, $p < .001$), and gender ($\beta = -0.23$, $SE = 0.06$, $p < .001$) explained 48.66% of variance. Boys outperformed girls. On level 2, according to the hypotheses, the class average mathematical achievement ($\beta = 0.47$, $SE = 0.12$, $p < .001$) and SET resource ($\beta = 0.14$, SE 0.06, $p < .05$) predicted the individual mathematical achievement at t2 (model 2). The higher the average class achievement and the more SET resource, the greater the achievement gain. The attitude of the GET

Table 3. Descriptive statistics of the variables of mathematical achievement, IQ and age in months.

Variable	Grade 1 *M* (SD)	Grade 2 *M* (SD)	Grade 3 *M* (SD)	Pupils with ID *M* (SD)
Math t1	23.53 (4.95)	16.39 (6.14)	19.08 (4.70)	43.90 (25.77)
Math t2	16.02 (4.92)	16.79 (6.34)	25.65 (6.50)	57.57 (28.37)
IQ	98.23 (14.22)	104.97 (14.93)	109.66 (12.25)	64.52 (11.73)
Age (months)	80.47 (5.29)	93.16 (5.43)	105.61 (5.41)	99.73 (8.86)

Note: In grade 1, 2 and 3 different math test were used for grade and time (see measures). Pupils with ID had the same test at t1 and t2.

Table 4. Hierarchical regression analysis for mathematical achievement of pupils with ID.

Modell	Predictor variable	*B*	*SE B*	*β*	R^2	ΔR^2	*p*
1	IQ	−0.12	0.21	−0.05	.31	.31	.551
2	Math t1	1.04	0.09	0.95	.84	.53	.000
3	Resource SET	−0.12	1.72	−0.12	.85	.01	.078

Table 5. Multilevel regression for mathematical achievement of typically developing pupils at t2 with the predictor average class math achievement, SET resource and attitude GET on level 2.

	Model 1			Model 2			Model 3a		
	β	*SE*	*p*	*β*	*SE*	*p*	*β*	*SE*	*p*
Intercept	0.27	0.11	.007	−0.22	0.23	*ns*	0.31	0.45	*ns*
Level 1									
Math achievement[a]	0.52	0.04	.000	0.52	0.04	.000	0.52	0.04	.000
IQ[b]	0.02	0.00	.000	0.02	0.00	.000	0.02	0.00	.000
Sex (m = 0, f = 1)	−0.23	0.06	.000	−0.23	0.06	.000	−0.23	0.06	.000
Level 2									
Class average math achievement	0.61	0.11	.000	0.47	0.12	.000	0.44	0.13	.000
SET resource	–	–	–	0.14	0.06	.023	0.12	0.06	.040
Attitude GET	–	–	–	–	–	–	−0.01	0.00	*ns*
Random part	*Var*			*Var*			*Var*		
σ_e^2	0.08			0.06			0.06		
σ_{u0}^2	0.41			0.40			0.41		
Explained variance									
R^2 (Level 1)	0.49			0.49			0.49		
R^2 (Level 2)	0.64			0.71			0.72		

Note: *N* = 525. Model 1 = model without SET resource and attitude GET; Model 2 = model without attitude GET; Model 3a = model with three predictors on level 2; [a]Centered at the group mean (classes). [b]Centered at the grand mean of the sample. Explained variance at level 1 and 2 compared to the intercept-only model.

(model 3a) had no significant impact ($\beta = -0.01$, $SE = 0.00$, *ns*). Therefore, the hypotheses that the GET's attitude had an impact on pupil mathematical achievement gain had to be rejected. The explained variance of model 3a was 63.65% on level 2. In model 3b to 3d (Table 6), GET's attitude towards inclusion was replaced by other teacher related variables.

The Beta coefficient for the GET having consistent rules (model 3b) was 0.00 ($SE = 0.00$, *ns*), for good GET time management (model 3c) was −0.02 ($SE = 0.07$, *ns*) and for SET knowledge (model 3d) it was 0.02 ($SE = 0.01$, *ns*). Contrary to the hypotheses, these variables had no impact.

Table 6. Multilevel regression for mathematical achievement of typically developing pupils at t2 with the predictors average class mathematical achievement, SET resource, and clear rules or time management or knowledge SET on level 2.

	Model 3b			Model 3c			Model 3d		
	β	*SE*	*p*	*β*	*SE*	*p*	*β*	*SE*	*p*
Intercept	−0.16	0.30	*ns*	−0.12	0.29	*ns*	−0.53	0.31	*ns*
Level 1									
Math achievement[a]	0.52	0.04	.000	0.51	0.04	.000	0.52	0.04	.000
IQ[b]	0.02	0.00	.000	0.02	0.00	.000	0.02	0.00	.000
Sex (m = 0, f = 1)	−0.23	0.06	.000	−0.23	0.06	.000	−0.23	0.06	.000
Level 2									
Class average math achievement	0.44	0.13	.000	0.51	0.13	.000	0.37	0.12	.000
Resources SET	0.12	0.06	.047	0.13	0.06	.042	0.14	0.06	.020
Clear rules	−0.00	0.06	*ns*	–	–	–	–	–	–
Time management	–	–	–	−0.02	0.07	*ns*	–	–	–
Knowledge SET	–	–	–	–	–	–	0.02	0.01	*ns*
Random part	*Var*			*Var*			*Var*		
σ_e^2	0.07			0.07			0.06		
σ_{u0}^2	0.41			0.41			0.41		
Explained variance									
R^2 (Level 1)	0.48			0.48			0.49		
R^2 (Level 2)	0.69			0.69			0.72		

Note: *N* = 525. Model 3b = model with clear rules; Model 3c = model with time management; Model 3d = model with knowledge SET; [a] Centred at the group mean (classes). [b]Centered at the grand mean of the sample. Explained variance at level 1 and 2 compared to the intercept-only model.

Discussion

This study examined the impact of teacher related variables – SET resource and different aspects of the teacher competence of the GET and the SET – on the mathematical achievement gain of pupils with and without ID by controlling for pupil characteristics (math t1, IQ, gender) and average class achievement. The selected variables reflect the challenge of nested instruction and existing knowledge about factors that affect pupils' achievement gain, such as SET resource and classroom management. In addition, factors that are claimed to be particularly important in inclusive classrooms, such as the attitude of the GET towards inclusion and the professional knowledge of the SET were considered. First, the results of classroom management and the attitude of the GET towards inclusion, which are similar in both samples, are discussed. Second, the focus is on the specific results of the sample^{ID} and the sample^{TYP}.

Contrary to the assumptions, which were based on evidence from regular classrooms (e.g. Korpershoek et al. 2016), the classroom management skills of the GET had no impact on pupils' mathematical achievement gain. One explanation for this result is the regular presence of two teachers, which was a common setting in 29 classrooms. This setting may prevent disruptive behaviour, and make it easier to implement consistent rules and provide more learning time. In addition, the result could be affected by the video setting; possible disruptive behaviour might have been reduced because of the presence of the cameras and the camera team.

Many researchers claim that if the GET has a positive attitude towards inclusion, it is beneficial for inclusive education outcomes (e.g. De Boer, Pijl, and Minnaert 2011; Desombre, Lamotte, and Jury 2019; Jordan, Glenn, and McGhie-Richmond 2010). However, it remains unclear how the pupils might be affected by the teacher's opinion of inclusion. Following on from the work of Blömeke, Gustafsson, and Shavelson (2015), it can be assumed that attitudes towards inclusion, as an affect-motivation disposition, affect teacher behaviour and therefore have an impact on the pupil mathematical achievement gains. This study was the first to evaluate this assumption. However, no such impact of GETs' attitudes towards inclusion was found. It is probable that the impact of attitude on achievement is mediated by teaching practices (e.g. classroom management). This could not be tested in this study, due to the small number of classes. Further, as reported by Bosse et al. (2016), it can be assumed that attitudes affect the personal experience of the teachers (e.g. stress) and not the experience of the pupils. Finally, it can be argued that a GET's attitude towards inclusion might have an impact on factors like the social acceptance and well-being of the pupils, rather than on achievement. To test these assumptions, additional analyses with bigger samples that also include data on pupils' social outcomes, would be necessary.

Sample of pupils with ID

In the sample of pupils with ID, mathematics performance at t1 explained a very big proportion of the variance, even if IQ was included in the first step into the model. This result is in line with other studies (e.g. Baroody 1999; Schnepel et al. 2020). Contrary to our hypothesis, no impact of the professional mathematical knowledge of the SET on mathematical achievement gain was evident. Detailed understanding of the mathematical development of pupils with ID may help to explain this result. According existing research (e.g. Brankaer, Ghesquière, and De Smedt 2011), the linkage of numbers and magnitudes is a crucial milestone in the numerical development of pupils with ID, which many pupils with ID in this study had not yet reached at t1 (Schnepel et al. 2020). It can therefore be assumed that among pupils with ID, individual factors – in this case the ability to link numbers and magnitudes – are more important than teacher related variables. However, this could be different for other subjects (e.g. reading, science, life skills).

Unexpectedly, the SET resource was not significantly associated with the mathematical achievement of the pupils with ID, but the significance threshold was narrowly missed. Considering the aforementioned results on the importance of the prior mathematical knowledge of pupils with ID, it can be assumed that these pupils progress only slowly and are less responsive to teacher instruction. The negative Beta coefficient of SET resource could be an artefact of the funding model, because resources for pupils with ID are allocated using the input model (Meijer 1999): the more severe the intellectual disability, the more hours of support are available.

Sample of typically developing pupils

Math achievement t1 explained the highest proportion of variance. As in other studies, it was found that boys scored higher than girls. The average mathematical achievement of the class was a significant predictor of a pupil's individual mathematical achievement gain. The higher the average class mathematical achievement, the higher the achievement gain of the pupil. This result is in line with other studies (e.g. Marsh, Kong, and Hau 2000), which show that the achievement level of the class affects the individuals. It is especially remarkable because eight classes of the sample were combination classes. This indicates that is important to take classroom composition into account (Burns and Mason 2002). Interestingly, SET resource was also a significant predictor of the achievement gain of the pupils without ID: The more hours a SET is present in the classroom, the higher the achievement gains (Bottge, Cohen, and Choi 2017). In 29 of the classes, the SET was often present in the classroom. Therefore, it can be assumed that the more hours a SET is present in the classroom, the more he or she is involved in the planning and teaching of activities for the whole class, which would then affect all pupils. However, no significant impact of the professional knowledge of the SET was found. Here, it would be interesting to examine the relationship between SET resource and the professional knowledge of the SET in greater detail in other studies.

Limitations of the study

Some limitations must be considered. First, the teachers participated voluntarily and this positive selection might have influenced the results. Second, the samples are quite small and the analyses had to be carried out separately for the pupils with and without ID. Therefore, the results have to be interpreted carefully. But it should be noted that the population of inclusive classes which are attended by pupils with ID is small and classes with more than one pupil with ID are scarce. From this perspective, the sample size is satisfactory. Third, even if one videotaped lesson per class should be enough to analyse classroom management (Praetorius et al. 2014), the videotaping may have affected the children and therefore the GET's classroom management. Fourth, it was not possible to take into account the different implementation of support from the SET (e.g. in-class support, resource room). Fifth, it could not be tested if the impact of GET's attitudes towards inclusion on mathematical achievement could be mediated by teaching practices (e.g. classroom management). Finally, considering the different roles and responsibilities of the GET and the SET, different variables for these teachers were selected. In any further study, it would be important to assess the same variables for both teachers. However, this would increase the number of variables and the complexity of the models, and thus requires big samples.

Conclusion

This study aimed to examine the impact of SET resource and selected variables of teacher competence in inclusive classrooms by investigating nested instruction. The results show that the examination of the impact of resources is challenging when the implementation of the SET support varies for different categories of SEN and when different funding models are allocated simultaneously. Nevertheless, the significant impact of SET resource on pupils without ID is particularly interesting. For further studies, it would be important to consider the different ways in which SET support is implemented (e.g. in-class support, resource room) and also to investigate the relationship between SET competence and SET resource.

In this study, it was not possible to disentangle the complex relationship of different aspects of the teacher competence of the GET and the SET. Variables which are known to affect the mathematical achievement gain in regular classrooms – such as classroom management – had no impact in these inclusive settings. More research is needed to unravel the complex relationship of pupil and teacher related variables, nested instruction and funding models in inclusive classrooms.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Swiss National Science Foundation [grant number: 146086].

Notes on contributors

Elisabeth Moser Opitz is a professor for Special and Inclusive Education at the Institute of Education at the University of Zurich.

Susanne Schnepel is a senior researcher at the Institute of Education at the University of Zurich.

Helena Krähenmann is a PhD student at the University of Zurich and a lecturer at the University of Applied Science and Arts Northwestern Switzerland.

Sarah Jandl is a former PhD student from the University of Zurich and a lecturer at the Zurich University of Teacher Education.

Franziska Felder is a former senior researcher from the University of Zurich and a Professor for Inclusive Education and Disability Research at the University of Vienna.

Rachel Sermier Dessemontet is a professor at the Department of Special Educational Needs at the University of Teacher Education in the State of Vaud, Lausanne.

References

Antonak, Richard F., and Barbara Larrivee. 1995. "Psychometric Analysis and Revision of the Opinions Relative to Mainstreaming Scale." *Exceptional Children* 62 (2): 139–149. doi:10.1177/001440299506200204.

Avramidis, Elias, A. Toulia, C. Tsihouridis, and V. Stroglios. 2019. "Teachers' Attitudes Towards Inclusion and Their Self-Efficacy for Inclusive Practices as Predictors of Willingness to Implement Peer Tutoring." *Journal of Research in Special Educational Needs* 19 (51): 49–59. doi:10.1111/1471-3802.12477.

Banks, Joanne, Denise Frawley, and Selina McCoy. 2015. "Achieving Inclusion? Effective Resourcing of Students With Special Educational Needs." *International Journal of Inclusive Education* 19 (9): 926–943. doi:10.1080/13603116.2015.1018344.

Baroody, Arthur J. 1999. "The Development of Basic Counting, Number, and Arithmetic Knowledge Among Children Classified as Mentally Handicapped." *International Review of Research in Mental Retardation* 22 (C.): 51–103. doi:10.1016/S0074-7750(08)60131-7.

Becker, Uwe. 2016. *Die Inklusionslüge. Behinderung im Flexiblen Kapitalismus* [The Lie of Inclusion. Disability in the Context of Flexible Capitalism]. 2nd ed. Bielefeld: transcript.

Bless, Gérard. 2007. *Zur Wirksamkeit der Integration* [The Effectiveness of Inclusive Education]. 3rd ed. Bern: Haupt.

Bliese, Paul. 2016. *Multilevel Modeling in R: A Brief Introduction to R, the Multilevel Package, and the Nlme Package*. https://cran.r-project.org/doc/contrib/Bliese_Multilevel.pdf.

Blömeke, Sigrid, Jan-Eric Gustafsson, and Richard J. Shavelson. 2015. "Beyond Dichotomies: Competence Viewed as a Continuum." *Zeitschrift für Psychologie* 223 (1): 3–13. doi:10.1027/2151-2604/a000194.

Bond, Trevor G., and Christine M. Fox. 2001. *Applying the Rasch Modell. Fundamental Measurement in the Human Sciences*. Mahwah, NJ: Lawrence Erlbaum.

Bosse, Stefanie, Thorsten Henke, Christian Jäntsch, Jennifer Lambrecht, Miriam Vock, and Nadine Spörer. 2016. "Die Entwicklung der Einstellung zum inklusiven Lernen und der Selbstwirksamkeit von Grundschullehrkräften [The Development of Inclusive Attitudes and Self-Efficacy of Primary Schoolteachers]." *Empirische Sonderpädagogik* 8 (1): 103–116. http://nbn-resolving.de/urn:nbn:de:0111-pedocs-118570.

Bottge, Brian A., Allan S. Cohen, and Hye-Jeong Choi. 2017. "Comparisons of Mathematics Intervention Effects in Resource and Inclusive Classrooms." *Exceptional Children* 84 (2): 197–212. doi:10.1177/0014402917736854.

Brankaer, Carmen, Pol Ghesquière, and Bert De Smedt. 2011. "Numerical Magnitude Processing in Children With Mild Intellectual Disabilities." *Research in Developmental Disabilities* 32 (6): 2853–2859. doi:10.1016/j.ridd.2011.05.020.

Burns, Robert B., and DeWayne A. Mason. 2002. "Class Composition and Student Achievement in Elementary Schools." *American Educational Research Journal* 39 (1): 207–233. doi:10.3102/00028312039001207.

Cohen, Jacob. 1969. *Statistical Power Analysis for the Behavioral Sciences*. New York: Academic Press.

De Boer, Anke, Sip Jan Pijl, and Alexander Minnaert. 2011. "Regular Primary Schoolteachers' Attitudes Towards Inclusive Education: A Review of the Literature." *International Journal of Inclusive Education* 15 (3): 331–353. doi:10.1080/13603110903030089.

Desombre, Caroline, Mathilde Lamotte, and Mickaël Jury. 2019. "French Teachers' General Attitude Toward Inclusion: The Indirect Effect of Teacher Efficacy." *Educational Psychology* 39 (1): 38–50. doi:10.1080/01443410.2018.1472219.

Feng, Li, and Tim R. Sass. 2013. "What Makes Special-Education Teachers Special? Teacher Training and Achievement of Students With Disabilities." *Economics of Education Review* 36 (C.): 122–134.
Gebhardt, Markus, Susanne Schwab, Hannelore Reicher, Barbara Ellmeier, Sonja Gmeiner, Peter Rossmann, and Barbara Gasteiger Klicpera. 2011. "Einstellungen von LehrerInnen zur schulischen Integration von Kindern mit einem sonderpädagogischen Förderbedarf in Österreich [Teachers' Attitudes Towards Inclusive Education in Austria]." *Empirische Sonderpädagogik* 3 (4): 275–290. https://www.psychologie-aktuell.com/fileadmin/download/esp/4-2011_20120104/gebhardt.pdf.
Goldan, Janka. 2019. "Demand-Oriented and Fair Allocation of Special Needs Teacher Resources for Inclusive Education – Assessment of a Newly Implemented Funding Model in North Rhine-Westphalia, Germany." *International Journal of Inclusive Education*. Advance Online Publication. doi:10.1080/13603116.2019.1568598.
Hattie, John. 2009. *Visible Learning. A Synthesis of Over 800 Meta-Analysis Relating to Achievement*. Oxon: Routledge.
Helmke, Andreas. 2014. *Unterrichtsqualität und Lehrerprofessionalität: Diagnose, Evaluation und Verbesserung des Unterrichts* [Teaching Quality and Professionalism of Teachers: Diagnose, Evaluation, and Improvement of Instruction]. 5th ed. Seelze: Klett-Kallmeyer.
Hill, Heather C., Brian Rowan, and Deborah Loewenberg Ball. 2005. "Effects of Teachers' Mathematical Knowledge for Teaching on Student Achievement." *American Educational Research Journal* 42 (2): 371–406. doi:10.3102/00028312042002371.
Jandl, Sarah, and Elisabeth Moser Opitz. 2017. "Mathematische Förderung von Kindern mit intellektueller Beeinträchtigung: Über welches fachspezifische professionelle Wissen verfügen Sonderschullehrkräfte [Professional Mathematical Knowledge: What Do Special Education Teacher Know About the Mathematical Instruction of Pupils With Intellectual Disability]." *Sonderpädagogische Förderung heute* 62 (2): 195–208. doi:10.3262/SOF1702195.
Jones, Nathan D., and Mary T. Brownell. 2014. "Examining the Use of Classroom Observations in the Evaluation of Special Education Teachers." *Assessment for Effective Intervention* 39 (2): 112–124. doi:10.1177/1534508413514103.
Jordan, Anne, Christine Glenn, and Donna McGhie-Richmond. 2010. "The Supporting Effective Teaching (SET) Project: The Relationship of Inclusive Teaching Practices to Teachers' Beliefs About Disability and Ability, and About Their Roles as Teachers." *Teaching and Teacher Education* 26 (2): 259–266. doi:10.1016/j.tate.2009.03.005.
Jordan, Anne, and Donna McGhie-Richmond. 2014. "Identifiying Effective Teaching Practices in Inclusive Classrooms." In *Measuring Inclusive Education (International Perspectives on Inclusive Education, Vol. 3)*, edited by T. Loreman and C. Forlin, 133–162. Bingley: Emerald Group Publishing. doi:10.1108/S1479-363620140000003027.
Kaufmann, Liane, Hans-Christoph Nürk, Martina Graf, Helga Krinzinger, Margarete Delazer, and Klaus Willmes-v. Hinckeldey. 2009. *TEDI-MATH. Test zur Erfassung numerisch-rechnerischer Fertigkeiten vom Kindergarten bis zur 3. Klasse* [Assessement of Numerical and Mathematical Skills from Kindergarten to Grade 3]. Bern: Huber.
Korpershoek, Hanke, Truus Harms, Hester de Boer, Mechteld van Kuijk, and Simone Doolaard. 2016. "A Meta-Analysis of the Effects of Classroom Management Strategies and Classroom Management Programs on Students' Academic, Behavioral, Emotional, and Motivational Outcomes." *Review of Educational Research* 86 (3): 643–680. doi:10.3102/0034654315626799.
Kounin, Jacob C. 2007. *Techniken der Klassenführung* [Techniques of Classroom Management]. Münster: Waxmann.
Kunter, Mareike, Uta Klusmann, Jürgen Baumert, Dirk Richter, Thamar Voss, and Axinja Hachfeld. 2013. "Professional Competence of Teachers: Effects on Instructional Quality and Student Development." *Journal of Educational Psychology* 105 (3): 805–820. doi:10.1037/a0032583.
Kunter, Mareike, and Thamar Voss. 2013. "The Model of Instructional Quality in COACTIV: A Multicriteria Analysis." In *Cognitive Activation in the Mathematics Classroom and*

Professional Competence of Teachers. Mathematics Teacher Education, Vol. 8, edited by Mareike Kunter, et al., 97–124. Boston: Springer.
Malki, Sharon, and Tomer Einat. 2018. “To Include or Not to Include – This is the Question: Attitudes of Inclusive Teachers Toward the Inclusion of Pupils with Intellectual Disabilities in Elementary Schools.” *Education, Citizenship and Social Justice* 13 (1): 65–80. doi:10.1177/1746197917705138.
Marsh, Herbert W., Chit-Kwong Kong, and Kit-Tai Hau. 2000. “Longitudinal Multilevel Models of the Big-Fish-Little-Pond Effect on Academic Self-Concept: Counterbalancing Contrast and Reflected-Glory Effects in Hong Kong Schools.” *Journal of Personality and Social Psychology* 78 (2): 337–349. doi:10.1037/0022-3514.78.2.337.
Meijer, Cor J. W. 1999. *Financing of Special Needs Education. A Seventeen-Country Study of the Relationship Between Financing of Special Needs Education and Inclusion*. Middelfart: European Agency for Development in Special Needs Education.
Moser Opitz, Elisabeth, et al. 2019. *BASIS-MATH-G3+*. Bern: Hogrefe.
Moser Opitz, Elisabeth, et al. 2020. *BASIS-MATH-G2+*. Bern: Hogrefe.
Paek, Inus, and Mark Wilson. 2011. “Formulating the Rasch Differential Item Functioning Model Under the Marginal Maximum Likelihood Estimation Context and Its Comparison With Mantel-Haenszel Procedure in Short Test and Small Sample Conditions.” *Educational and Psychological Measurement* 71 (6): 1023–1046. doi:10.1177/0013164411400734.
Pajares, M. Frank. 1992. “Teachers’ Beliefs and Educational Research: Cleaning Up a Messy Construct.” *Review of Educational Research* 62 (3): 307–332. doi:10.3102/00346543062003307.
Pit-ten Cate, Ineke M., Mariya Markova, Mireille Krischler, and Sabine Krolak-Schwerdt. 2018. “Promoting Inclusive Education: The Role of Teachers’ Competence and Attitudes.” *Insights Into Learning Disabilities* 15 (1): 49–63.
Praetorius, Anna-Katharina, Christine Pauli, Kurt Reusser, Katrin Rakoczy, and Eckhard Klieme. 2014. “One Lesson Is All You Need? Stability of Instructional Quality Across Lessons.” *Learning and Instruction* 31 (June): 2–12. doi:10.1016/j.learninstruc.2013.12.002.
Rakoczy, Katrin, and Christine Pauli. 2006. “Hoch inferentes Rating: Beurteilung der Qualität unterrichtlicher Prozesse [High-Inference Rating: Evaluating the Quality of Teaching Processes].” In *Videoanalysen* [Video Analyses], edited by Isabelle Hugener, et al., 206–233. Frankfurt am Main: DIPF.
Saloviita, Timo. 2019. “Teacher Attitudes Towards the Inclusion of Students With Support Needs.” *Journal of Research in Special Educational Needs* 20 (1): 64–73. doi:10.1111/1471-3802.12466.
Schnepel, Susanne, Helena Krähenmann, Rachel Sermier Dessemontet, and Elisabeth Moser Opitz. 2020. “The Mathematical Progress of Students With an Intellectual Disability in Inclusive Classrooms: Results of a Longitudinal Study.” *Mathematics Education Research Journal* 32: 103–119. doi:10.1007/s13394-019-00295-w.
Smith, Ewerett V., and Richard M. Smith. 2004. *Introduction to Rasch Measurement: Theory, Models and Applications*. Maple Grove: JAM Press.
Soodak, Leslie C., and Mary R. McCarthy. 2006. “Classroom Management in Inclusive Settings.” In *Handbook of Classroom Management*, edited by Carolyn M. Evertson and Carol S. Weinstein, 461–489. New York: Routledge.
Tellegen, Peter J., Jacob Arie Laros, and Franz Petermann. 2007. *SON-R 2 1/2-7: Non-Verbal Intelligence Test*. Göttingen: Hogrefe.
Weiß, Rudolf H., and Jürgen Osterland. 2013. *CFT 1-R: Cultur-Fair-Intelligence Test Scale 1*. Göttingen: Hogrefe.
Wilson, Claire, Lisa Marks Woolfson and Kevin Durkin. 2019. “The Impact of Explicit and Implicit Teacher Beliefs on Reports of Inclusive Teaching Practices in Scotland.” *International Journal of Inclusive Education*. doi:10.1080/13603116.2019.1658813.