From Primary School to Vocational Training and Tertiary Education—Study Design of BiKS-8-18

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Abstract

This article provides an overview of the study design, the sampling procedure, the applied instruments, and the research potential of BiKS-8-18 "Educational Processes, Competence Development, and Formation of Educational Decisions in Preschool and School Age"). BiKS-8-18 is a panel study, which followed students in the German federal states of Bavaria and Hesse from 2006 through 2016 to trace their educational trajectories and competence developments. One of the major aims of the study was to gather suitable longitudinal data to explain previous findings of international large-scale assessments such as PISA, e.g., on the importance of social origin for educational achievements. The study is characterized by an interdisciplinary approach that includes pedagogical, psychological, and sociological perspectives. The study followed students from primary school over their educational career until their transitions from general education into tertiary education or vocational education when they were around 18–19 years old. During their time in primary school and

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secondary school, the study assessed children's competencies and their familial and institutional learning environments. Additionally, children's parents and teachers were interviewed. The initial sample consisted of 2,395 children in Grade 3. In Grade 5, the sample was expanded by further 879 secondary school students within BiKS-8-18 study classes.

Keywords

Primary school · Secondary school · Vocational education and training · Educational trajectories · Longitudinal data

1 Introduction

The aim of the interdisciplinary BiKS study "Educational Processes, Competence Development, and the Formation of Selection Decisions in Preschool and School Age" is the longitudinal investigation of educational and competence development processes. For this purpose, two panel studies (BiKS-3-18; BiKS-8-18) with surveys in the German states of Bavaria and Hesse have been conducted since 2005. This was done against the background of two weaknesses of the German education system, which came to light in the wake of international comparative school performance studies such as PISA 2000 (see e.g., Baumert et al. 2001): On the one hand, students at German schools showed an unexpectedly low level of competence in an international comparison. This was especially true in the lower performance groups and across different competence areas. On the other hand, particularly pronounced disparities in educational participation and skill acquisition had become apparent for students of different social origins and nationalities or migration statuses.

In BiKS-8-18, beginning in 2006, a sample of primary school children in Grade 3 was accompanied for the next ten years of formal education. The transition from primary school to lower secondary school is arguably still the crucial point in the German educational system, and it is critical for the development of social disparities (Maaz et al. 2006). Therefore, the longitudinal study BiKS-8-18 focused on the development of competencies and interests, the formation of educational decisions before and after the transition to lower secondary schooling as well as the continuation of developmental trajectories in lower secondary schooling. Using a multi-method, multi-perspective and multi-level design, the effects of the learning environments of family, primary school, and secondary school, and the interactions between these factors on child development were examined

over a period of ten years. On the other hand, BiKS-8-18 focused on the transition from upper secondary school to the vocational training sector and the labor market by surveying adolescents across additional follow-up surveys.

The remainder of this chapter is structured as follows: First, we describe the study design of BiKS-8-18. Then, we describe the sampling and different subsample tracking strategies in detail to understand their limitations and potentials. After that, we provide an overview of the study instruments we used to provide a rich multi-level data set. Finally, we briefly discuss the research potentials of the data by illustrating research that has previously been done with the BiKS longitudinal data.

2 Study Design

BiKS-8-18 can be structured in three phases. The first phase consists of the data collection when the sampled children were in the second half of primary school in Grade 3 until they transitioned into lower secondary schooling after Grade 4. The second phase covers the period of lower secondary schooling until the transition into either upper secondary schooling on their path to tertiary education or into vocational education and training (VET), i.e., from Grade 5 through Grade 9 and 10, respectively. The third phase contains students' time in upper secondary schooling or VET and their transition into either tertiary education or labor market entrance.

2.1 Multi-Perspective Panel Design

The surveys of the first phase of the BiKS-8-18 took place in the states of Bavaria and Hesse and began in spring 2006 in the second half of third grade in 155 classes in 82 primary schools (see Sect. 2.2). The children of the 2,395 participating families were surveyed in three panel waves in six-month intervals. Data collection included the assessment of the children's competencies. These children transferred to a secondary school in the fall of 2007. In the second phase, these children and their parents were followed at annual intervals in five panel waves until the end of ninth grade. In the last phase, the students' transition into upper secondary school to the vocational training sector or the labor market was examined in three additional panel waves (see Fig. 1).

The first and second phases followed a multi-perspective design, which included in addition to student questionnaire and competence tests on the indi-

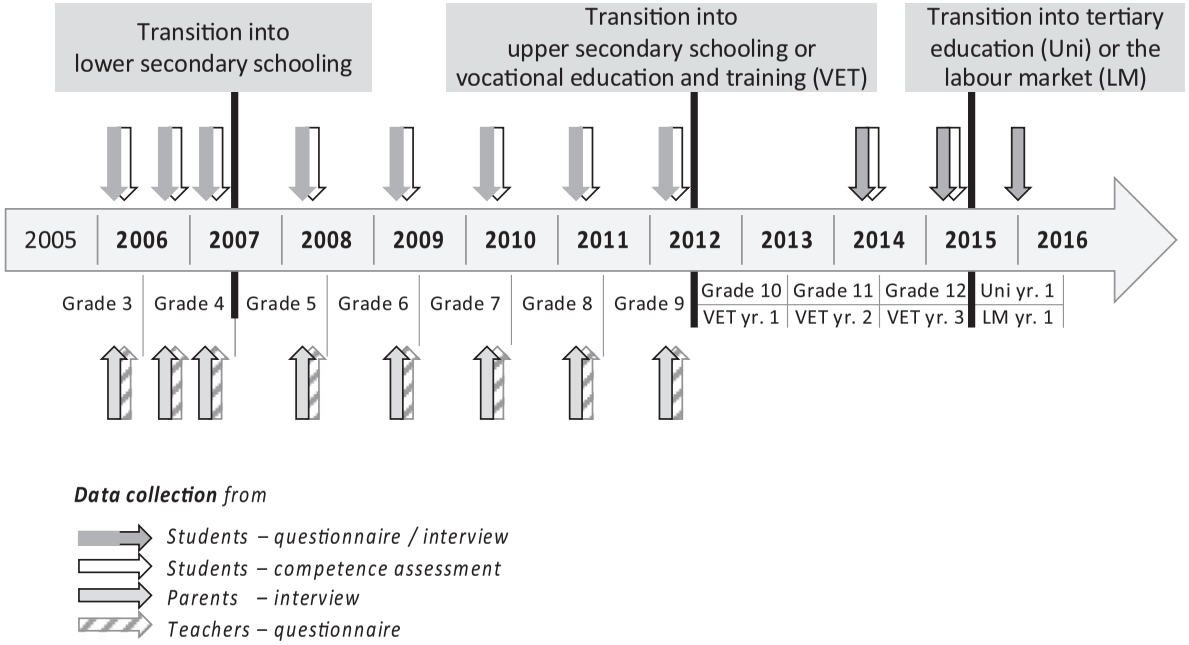


Fig. 1 Study design of BiKS-8-18

vidual level also parent interviews and questionnaires for teachers, thus covering central contexts of the family and institutional learning environment (for further details, see von Maurice et al. 2007). The surveys in the third phase exclusively focused on the individual students.

In primary school, educational trajectories are typically linear and uniform, i.e., with infrequent class or school changes (Bellenberg 2020). With the transition to the various types of secondary school, there is a clear pluralization of school and educational trajectories in Germany: In addition to local school changes, there were also changes in school types and grade level as high performing students could change to a more demanding school type or low performing students may repeat a grade level or even change to a less demanding school type (Bellenberg 2020). Therefore, already in the second phase, surveys in the school context could not be continued equally for all students to cope with this complexity on a practical level. This led to different survey and testing strategies (see Sect. 2.3). Although students were the main target persons, the contact and interviewing strategy differed in the study phases. In the first phase, students were primarily interviewed and tested in the school context, and their parents were the primary contact persons. In the second phase, most students were interviewed in the school context, and some students were surveyed individually. In the last phase, the focus was entirely on the students themselves. Data collection was individualized and without the inclusion of parents or learning context.

To investigate the different research questions longitudinally, 11 panel waves were conducted with a multi-method design in which different survey and test instruments were used. In the first and second phases, the parent interviews were conducted as computer-assisted telephone interviews (CATI). Students and teachers received paper-and-pencil questionnaires (PAPI), and students' competence assessments were also paper-based (PBA). In the third phase, all survey instruments were either CATI or CAWI (computer-assisted web interview). While the CATI was the primary mode in this phase, the CAWI were mainly used to interview students who were difficult to reach by telephone.

2.2 Sampling Process in Two Federal States

The sampling of BiKS-8-18 followed a stratified multi-step process (for details on the sampling process, see Kurz et al. 2007). In the first step, two federal states, Bavaria and Hesse, were selected. The guiding principle for selecting these two states was to vary relevant contextual factors that determine individual educational decisions systematically. On the one hand, these were the state-specific

differences regarding the transition regulations from primary school to secondary schools, in which different emphasis was given to the parents' free choice and the school track recommendation. According to the regulations of the state of Bavaria, school track recommendation given by the teacher(s) at the end of primary school was of primary importance, and students without a track recommendation have to pass an additional entrance examination. In Hesse, on the other hand, parents were ultimately free to choose the school type in secondary education (see Faust 2005; Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany 2010). Second, the two states significantly differed in terms of the structure of secondary schooling. In Bavaria, the choice of schools included Hauptschulen (lower track schools), Realschulen (middle track schools), Gymnasien (higher or academic track schools), and in some few cases, Gesamtschulen (comprehensive schools). In contrast, integrated and cooperative Gesamtschulen (comprehensive and multi-track schools) were additional regular school types in Hesse.

In the second step, specific survey regions within the federal states were selected based on similarities and differences in the respective opportunity structures and socioeconomic conditions (e.g., presence of different school forms, accessibility, employed persons by economic sectors). This led to the selection of one large city (Bavaria: Nuremberg, Hesse: Frankfurt), one medium-sized city (Bavaria: Bamberg, Hesse: Darmstadt), and two rural districts (Bavaria: Bamberg and Forchheim, Hesse: Bergstrasse and Odenwaldkreis).

In the third step, primary schools were recruited. The following disproportional distributions of participating schools were targeted: First, disproportional stratification by federal state with a ratio of Bavarian and Hessian schools of 60:40, and second, disproportionate stratification by major cities: One-third of schools each of Bavarian and Hessian schools were to come from the metropolitan regions of Nuremberg and Frankfurt respectively. For practical reasons, this was done to link BiKS-8-18 to the other cohort BiKS-3-18 (see Homuth, Lehrl, et al. this volume). The linkage was supposed to be established by recruiting primary schools named by the preschool teachers of BiKS-3-18 as their most important schools where their students would transition to.

In the last step, parents of students in the participating schools were asked to participate in the survey. This resulted in the initial sample of $n = 2{,}395$ participating children in wave 1.

2.3 Different Survey and Test Strategies

BiKS-8-18 started in 2006 with 2,395 participating primary school students and their parents. In the fall of 2007, the majority of the children moved on to secondary schools. The aim of the second phase was to continue to follow the remaining participants of the initial sample ($n = 2{,}104$, corresponding to 88%) and to expand the sample to include the class context by including their classmates in the study. Since the number of receiving secondary schools was too large to continue to study all participants in the class context together with their new classmates, and not all children transitioned to secondary schools located within the BiKS survey regions, three different survey and test strategies were used (see Fig. 2):

In the first strategy, participants were no longer surveyed in the school context but individually outside their schools. This concerned $n = 802$ children who either attended schools outside the BiKS survey regions or schools with fewer than three children of the initial sample. Furthermore, children were moved to

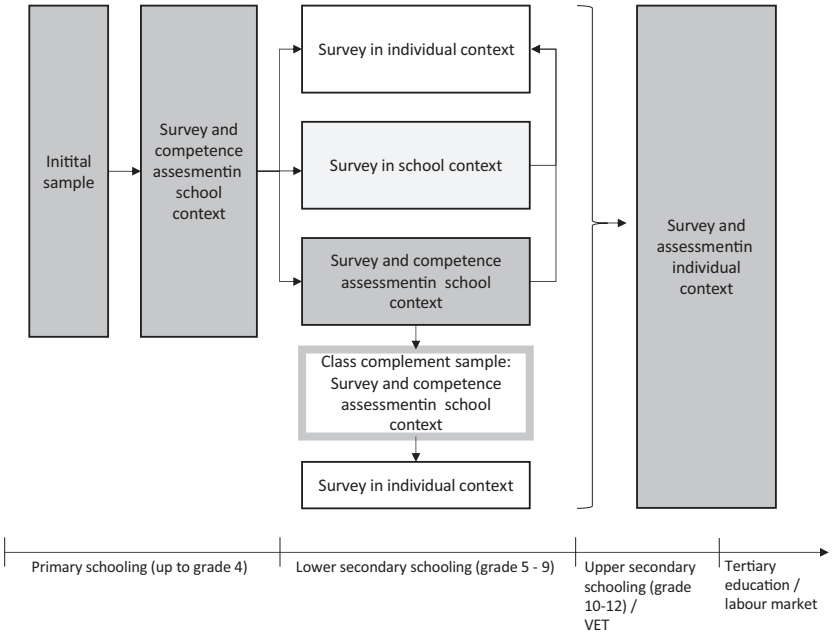


Fig. 2 Survey, interview, and test strategy in BiKS-8-18

individual surveying if no information was available about the secondary schools they attended or if their school generally refused to participate.

In the second strategy, students and teachers were only interviewed via paper questionnaires that were administered by the class teachers within the school context. A total of $n = 382$ children at comprehensive schools, special-needs schools, and schools that did not extend their participation, as well as children at schools in which fewer than three children of the initial sample attended the same class were accompanied this way.

In the third strategy, the remaining $n = 920$ students in schools with at least one class with three or more children of the initial sample were included. For this subgroup, an attempt was made to include the class context, i.e., all their classmates, in the study. This way, $n = 879$ children could be recruited additionally as class complement sample. In these schools, all children of the initial sample and the class complement sample were surveyed and tested in class.

If schools no longer agreed to study participation in class, they were asked to switch to the second strategy without competence testing in class. If a school was also not (anymore) willing to participate in this strategy, all children of these schools finally switched to the individual survey context. Furthermore, it happened that individual children switched from one of the two school survey variants to the individual survey variant due to a change of school or, in rare cases, vice versa, switched to a school that participated in the BiKS surveys.

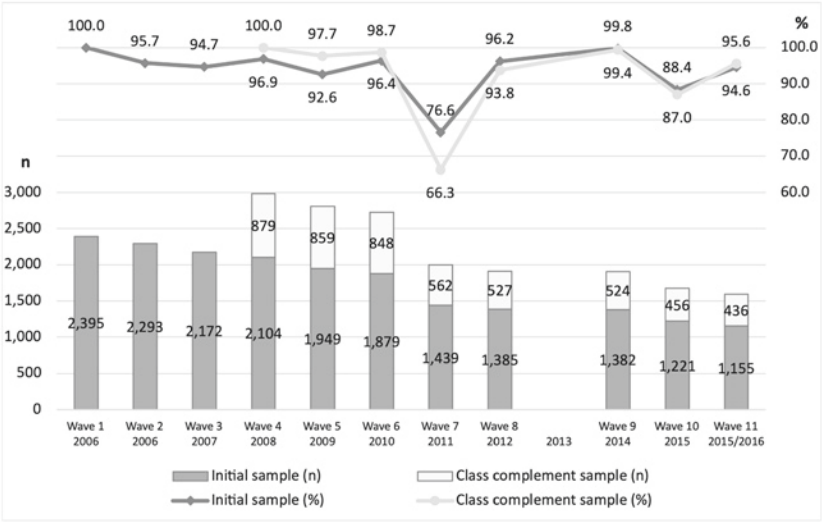
Additionally, to enhance the class complement sample in lower secondary schools (Hauptschulen), $n = 14$ additional students in these schools were included in the sample.

With the beginning of the third phase of the study, all remaining participating students were surveyed and tested in individual contexts.

3 Sample Development and Panel Participation Rates

Figure 3 shows the evolution of the BiKS-8-18 (gross) panel sample over time and panel participation rates[1] differentiated by the initial sample and the class complement sample. Of the $n = 2{,}395$ primary school children sampled initially in wave 1 in 2006, $n = 1{,}157$ (48.3%) were still part of the panel sample at the

[1] Panel participation rate is defined as the share of remaining gross panel sample of the gross panel sample of the respective previous panel wave. Response rates of all instruments by waves are provided in Table 3.



Note: Participation rate in relation to the remaining gross panel sample of the respective previous wave.

Fig. 3 Sample development of BiKS-8–18 (absolute) and panel participation rates (in percent)

end of the study in 2016. Of the $n = 879$ participants who were included in the study as part of the class complement sample in the fifth grade (see Schmidt et al. 2009), $n = 436$ (49.6%) remained until the end of the study. Both the initial and class complement samples consistently showed high participation rates. This could be attributed mainly to effective panel management, which consisted mainly of personal contact, the sending of information material, regular feedback on results, and the effective use of incentives (for a detailed description of the incentivization strategy, see Mudiappa and Schmitt 2010).

Figure 3 also shows that in wave 7, panel participation rates significantly dropped below the average, with only about 68% for the class complement sample and 77% for the initial sample. The drop in the panel participation rate at wave 7 can be attributed to the fact that it became necessary for the Bavarian subsample to obtain written panel consents again. Prior to wave 7 and due to regulatory change in Bavaria, it was necessary to obtain again written consent from the Bavarian families being interviewed in the school context. Since the participating adolescents were already 14 years old at this time, they had to explicitly consent in addition to their parents. Only if both parents and adolescents had given their

consent, the family could be interviewed further. Only those families who had actively provided their consent were allowed to remain in the study.

This not only led to a decline in the panel participation rate but also to an aggravation of the selective panel mortality typical for panel studies (for further details, see Homuth et al. 2017). Analyses showed that the high dropout at wave 7 was precisely due to the affected subgroup of Bavarian families in the school survey. In contrast, Hessian and Bavarian families in the individual survey strategy variant did not show a disproportionately high tendency to leave the panel (Homuth et al. 2017).

4 Sample Description

4.1 Basic Composition

Table 1 provides a supplementary overview of the basic sample characteristics and distributions at the beginning and end of each phase. The distribution across the states shifted slightly in favor of Bavarian families from waves 1 to 4 due to the higher proportion of Bavarian families as part of the class complement sample. Classmates in comprehensive schools were not included in the class complement sample, so the lower proportion of Hessian children is due to such study design decisions. In the third phase, in waves 8 to 11, the described selective dropout of Bavarian participants led to a relatively equal distribution across states.

The proportion of girls in the complete sample after the inclusion of the class complement sample was also significantly higher than in the initial sample. Regarding the sample composition in terms of social origin characteristics, shifts in the sample composition from the first to the second phase could be observed in the direction of more highly educated parents as well as parents with an upper socioeconomic position and children without a migration background still participating. This can be explained by the comparatively higher participation rates of families with a high socioeconomic position, of parents with a academic educational background, and of families without an immigrant background in the class complement sample. Higher response rates at academic track schools (Gymnasium) in comparison to other school types are the primary explanation for this change in the sample composition. Accordingly, a disproportionate number of children from this type of school were added. Thus, a larger share of children from homes with these characteristics was newly included in the study.

Table 1 Selected sample characteristics of the longitudinal study BiKS-8-18

Wave	Wave 1	Wave 3	Wave 4	Wave 8	Wave 9	Wave 11
Date	March 2006	June 2007	May 2008	June 2012	June 2014	December 2015
Sample size	n = 2,395	n = 2,172	n = 2,983	n = 1,912	n = 1,906	n = 1,591
Sex	52.2% male 47.8% female	51.8% male 48.2% female	49.9% male 50.1% female	49.8% male 50.2% female	49.9% male 50.1% female	48.4% male 51.6% female
Age in months	M = 110.7 SD = 5.7	M = 125.5 SD = 5.5	M = 136.5 SD = 5.7	M = 185.3 SD = 5.5	M = 209.3 SD = 5.5	M = 227.2 SD = 5.4
Federal state	35.0% Hesse 65.0% Bavaria	34.1% Hesse 65.9% Bavaria	32.3% Hesse 67.7% Bavaria	41.5% Hesse 58.5% Bavaria	41.3% Hesse 58.7% Bavaria	41.0% Hesse 59.0% Bavaria
Socioeconomic status (HISEI)[1]	M = 53.0 SD = 16.2	M = 53.5 SD = 15.9	M = 54.7 SD = 16.0	M = 56.4 SD = 15.7	M = 56.4 SD = 15.7	M = 57.1 SD = 15.7
Highest parental education[2]						
Lower secondary [quali. Hauptschule]	23.7%	22.3%	19.1%	15.8%	15.8%	14.7%
Medium secondary [Mittlere Reife]	33.0%	33.4%	32.0%	30.8%	30.8%	29.3%
University admission [Fach-/Abitur]	43.3%	44.3%	48.9%	53.5%	53.5%	56.0%
Migration background[3]						
Without migration background	75.3%	76.0%	77.7%	76.7%	76.7%	76.7%
At least one parent born abroad	24.7%	24.0%	22.3%	23.3%	23.3%	23.3%

Notes: M = mean, *SD* = standard deviation; *HISEI* = Highest ISEI (International Socio-Economic Index of Occupational Status; see Ganzeboom et al. 1992) in the family
1 Highest value over all panel waves; rate of missing values = 6.5%.
2 Highest value over all panel waves; rate of missing values = 7.4%.
3 Rate of missing information = 8.1%.

4.2 Selectivity

Like in any other longitudinal study, selective panel attrition is a paramount concern (Rendtel 1995). One major question is whether the dropouts were neutral concerning central sample indicators. Overall, continued participation was not systematically biased on the dimensions gender, age of the participants, region, social origin, parental education, and migration background, which taken together accounted for only 0–10% of the total variance in participation in each panel wave (cf. adjusted R^2 in Table A1 in the Appendix).

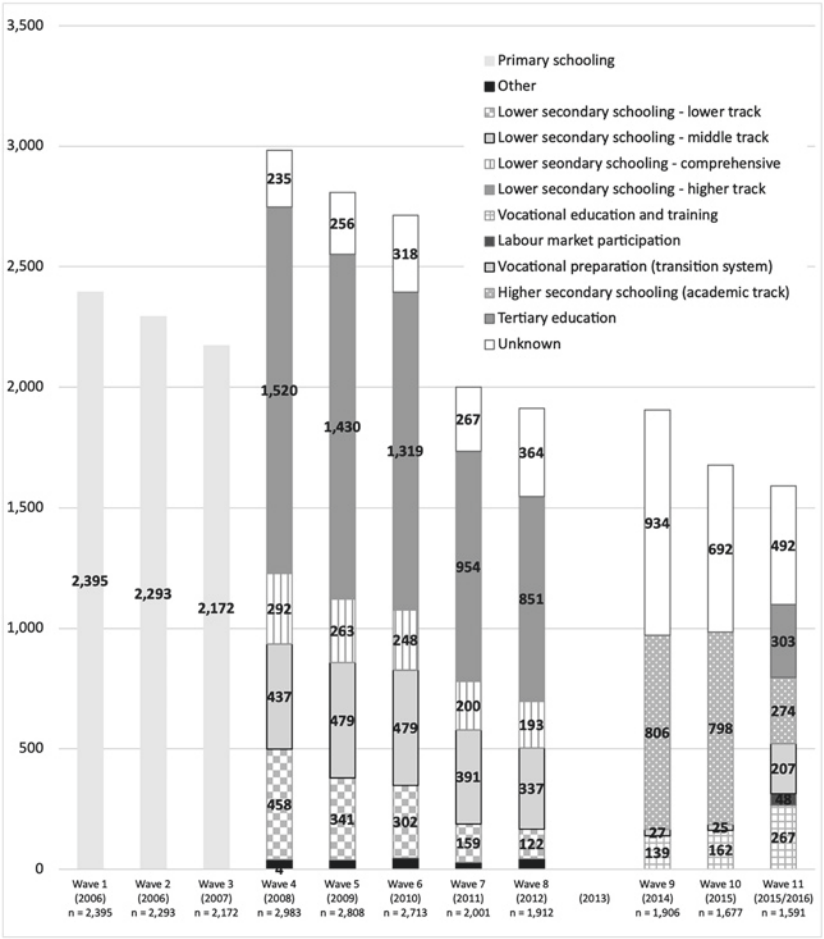
As expected in longitudinal studies (e.g., Behr et al. 2005), the proportion of higher-educated families increased over time as lower-educated families had on average a higher dropout risk. However, the dropouts of participants with less-educated parents mostly occur at specific times (waves 2, 3, 8, and 11) and not each wave. It seems that the parents of the class complement sample were on average significantly higher educated across all waves due to higher participation rates in academic track schools (*Gymnasium*). Concerning the socioeconomic status and the migration status of the participants, no specific attrition patterns can be identified. Mean HISEI and standard deviations vary only slightly both in the group children of the initial sample and the class complement sample. Again, only the differences between the groups are substantial but not between waves.

This also applies to the migration background: At the beginning of the study, 23.6% of the initial sample and 18.8% of the class complement sample had at least one parent who was not born in Germany. At the end of the study (wave 11), the share of migrant students was 23.3%, which is about the same as at the beginning of phase two of the study at the beginning of lower secondary schooling (wave 4).

There were significant changes in composition in the third study phase as the dropout between these last waves was selective along the dimensions of gender, social status, and educational background. Mainly male participants and those from lower education and low social status households left the sample. The dropout was not significantly correlated to migrant background or spatial distribution (federal state).

4.3 Educational Trajectories

In the first phase of BiKS-8-18, all students by design attended primary school. With the beginning of the second phase, i.e., the transition into secondary school, the educational trajectories of the sample start to diverge. Figure 4 shows the educational status of the sample at the respective wave.



Notes: The participants' educational statuses were separated into six categories. The assignment to the respective category was based on the information given at the time of the survey:

- *Vocational education and training* include all respondents undergoing training either in the dual system or at a vocational school.
- *Tertiary education* includes all students enrolled at a university, university of applied sciences, or vocational academy or who are completing a dual course of study.
- *Vocational preparation* includes persons who are neither attending a general school nor undergoing vocational training. This group also includes persons doing voluntary service, an internship, a voluntary social year (FJS) or military service, and persons on stays abroad.
- *Labour market participation* includes all participants who stated in the survey that they are pursuing a professional activity that is not part of a training program or course of study.

Fig. 4 Educational status over time

Due to the selective participation of classmates of the initial sample as part of the class complement sample, the proportion of students attending the higher academic track of secondary schooling was the largest from wave 4 onwards. Due to a change in the survey and assessment strategies, there was a group of participants for whom we do not have the information about their respective educational status or attended school type, respectively.

Educational trajectories further diverged in the third phase of the study. This phase encompassed the transition from lower secondary schooling into either upper secondary schooling or vocational education and training (VET) and beyond. At the end of study phase three, there were still participants who attended a general education school, while others had already entered tertiary education or the labor market.

At wave 9, the majority of the sample ($n = 806$) was attending a general education school (mostly higher track school/Gymnasium), $n = 139$ were undergoing vocational training, and $n = 27$ indicated that they were neither attending school nor in vocational training; no information was available for $n = 934$ participants. In wave 10, there were no significant changes; $n = 798$ participants were still attending a general education school, $n = 162$ were in training, and $n = 25$ were classified as participants in vocational preparation (transition system). In wave 11, the picture changes: most participants made a transition. Only $n = 274$ participants were still attending a general education school. In contrast, $n = 267$ were in VET, $n = 303$ had started a tertiary education, and $n = 48$ participants had entered the labor market. Interestingly, however, a rather large group of $n = 207$ was still in vocational preparation. Among them were a particularly large number of high school graduates who stated that they wanted to take a "time-out" first.

5 Contents of the Study

5.1 Instruments and Measurement Times

Table 2 provides an overview of the instruments by context, when and in which mode they were employed, and their main contexts.

During the first eight waves, students were interviewed by paper-based questionnaires. In the third phase of the study (waves 9-11), students were the single informant, and the interviews were telephone-based. An additional web interview was conducted in the last two waves to interview participants who could not be reached via telephone interview.

Table 2 Overview of instruments

Target / Instrument	*Waves (W)*	*Mode*	*Contents*
Individual level			
Student questionnaire	W1-W8	PAPI	Students' attitudes toward school and learning and their motivation
Student interview	W9-W11	CATI, CAWI	Educational status, aspirations, motivation, interests
Competence assessment (group testing)	W1-W8	PBA	Competency assessment in a classroom context in several domains, including language development, reading comprehension, grammar, cognitive skills, numeracy
Competence assessment (individual testing)	W9-W10	CATI	Verbal fluency tests
Child-related assessment sheet	W1-W8	PAPI	Assessments of abilities, motivation and characteristics of the child's social behavior from the educator's point of view
Family level			
Parent interview	W1-W8	CATI	Housing situation, the family's financial situation, the child's care history, experiences with preschool, the family's endowment with cultural capital, everyday family life, child-rearing and educational attitudes, the child's assessment of social behavior, development, and the child's goals or educational aspirations of the parents for the child
Class level			
Class teacher questionnaire	W1-W8	PAPI	Structural information (e.g., social, ethnic, achievement composition) and teachers' characteristics (e.g., education and attitudes) on the class level

Notes:
CATI Computer-assisted Telephone Interview
CAWI Computer-assisted Web Interview
PBA Paper-based assessment
PAPI Paper-and-pencil Interview (Questionnaire, Test sheets)

Parental data were obtained by interviewing the parents primarily concerned with the children's school matters. These parents were interviewed via CATI (Computer-assisted telephone interview) at all waves during the first two study phases (waves 1-8).

During the first two phases of primary and lower secondary schooling, participants' class teachers were interviewed via a paper questionnaire which included a child-related assessment sheet for each participating student. In the survey group which included students' competence assessment in waves 4 through 8, teachers completed the additional child-related assessment sheet as well. Teachers were surveyed at waves 4 through 8 in both school-based survey groups (with and without competence assessment), analogous to waves 1 through 3. While, in the intensive version, the class and subject teachers (English as a first foreign language, Mathematics, and German) were included in the survey. In the non-intensive version, only the class teacher was asked to participate.

5.2 Response Rates by Instruments and Waves

Numerous instruments were used in the BiKS-8-18 (see Table 3). The assessment of students' competencies and student questionnaires were a central component in the first and second phases of the study. In waves 1 to 3, all children participated in competence assessments and answered questionnaires in the classroom context. After the transfer to the secondary schools, only the subgroup of participants in the third survey strategy provided for differentiated testing of the children's competencies and student surveies were conducted in the interviewer-controlled class context, analogous to the procedure during the primary school period. In the second survey strategy, the response rate was mainly dependent on the cooperation of the participating teachers who handed out the questionnaires themselves. While the response rate in this group was almost as high as in the third survey strategy up to wave 6, response rates declined in waves 7 and 8. In the individual survey strategy, which was highly dependent on the cooperation of the parents, average response rates of about 65% were achieved.

With the transition into the third study phase, participation dropped significantly. When the interviewers contacted them, many participants withdrew their consent to further participation.

The following reasons can be seen as significant for the lower participation rates in Waves 9 to 11 compared to the previous waves:

1. Change of the primary contact person: During the entire duration of the first and second phases of BiKS-8-18, the children's parents were the primary contact persons. The adolescents were not used to being contacted directly and being responsible for their participation in the study.
2. Change of the survey mode: In the first and second phases of BiKS-8-18, the children were interviewed exclusively by paper-based questionnaires, and their parents were interviewed by telephone. However, it was always possible to participate only by sending back the paper questionnaire so that there had always been persons for whom no telephone numbers were available.
3. Greater time interval between interviews: While all surveys (except wave 2) took place at annual intervals in the second half of the respective school year, two school years elapsed between wave 8 and wave 9.
4. Increased mobility: With the end of compulsory schooling and the move to vocational and tertiary education, the mobility of adolescents is increasing, as relocation due to training and studying is unavoidable for many. Additionally, many adolescents spend time abroad either during upper secondary school or after graduating for voluntary service or work-and-travel stays.
5. Reduced accessibility: Adolescents who complete training or vocational preparation usually work full-time and can only be reached in the late afternoon, evenings, and weekends. In some professions, shift work is added to this, further limiting accessibility by telephone.

6 Research Potentials of BiKS-8-18

The BiKS-8-18 study offers a broad dataset that allows high-quality empirical education research within the German education system from an interdisciplinary perspective. Therefore, the BiKS study has contributed and will contribute substantially to a better understanding of educational decision making, learning and teaching processes, and the educational outcomes of these processes.

For example, in the BiKS-8-18 study, a strong emphasis was placed on assessing students' academic competencies and tracing their development from primary to secondary school. Thereby, the focus was on general cognitive abilities, mathematics, oral language and reading skills. Furthermore, psychological variables important for students' academic development such as self-concept, school-subject interests, goals, and motivation were considered. As the BiKS study incorporates the perspectives of students, parents, and teachers, a broad set of variables that may cause individual differences in the development of academic competencies may be explored. Furthermore, as students were assessed within their class

Table 3 Sample sizes and response rates by panel waves and instrument

	Instrument	Mode	Sample	Valid	Response rate in %
Wave1	Child questionnaire	PAPI	2,395	2,202	91..9
	Competence assessment	PBT	2,395	2,276	95..0
	Parent interview	CATI	2,395	2,238	93..4
	Teacher–Child-Rating	PAPI	2,395	2,276	95..0
	Teacher questionnaire	PAPI	2,395	2,247	93..8
Wave 2	Child questionnaire	PAPI	2,293	2,157	94..1
	Competence assessment	PBT	2,293	2,182	95.2
	Parent interview	CATI	2,293	2,022	88.2
	Teacher–Child-Rating	PAPI	2,293	2,093	91.3
	Teacher questionnaire	PAPI	2,293	2,142	93.4
Wave 3	Child questionnaire	PAPI	2,172	2,024	93.2
	Competence assessment	PBT	2,172	2,032	93.6
	Parent interview	CATI	2,172	1,792	82.5
	Teacher–Child-Rating	PAPI	2,172	1,991	91.7
	Teacher questionnaire	PAPI	2,172	2,044	94.1
Wave 4	Child questionnaire	PAPI	2,983	2,431	81.5
	Competence assessment	PBT	1,799	1,636	90.9
	Parent interview	CATI	2,983	2,458	82.4
	Teacher–Child-Rating	PAPI	2,181	1,872	85.8
	Teacher questionnaire	PAPI	2,181	1,862	85.4
Wave 5	Child questionnaire	PAPI	2,808	2,268	80.8
	Competence assessment	PBT	1,562	1,437	92.0
	Parent interview	CATI	2,808	2,218	79.0
	Teacher–Child-Rating	PAPI	1,896	1,680	88.6
	Teacher questionnaire	PAPI	1,896	1,640	86.5
Wave 6	Child questionnaire	PAPI	2,713	2,108	77.7
	Competence assessment	PBT	1,426	1,252	87.8
	Parent interview	CATI	2,727	2,023	74.2
	Teacher–Child-Rating	PAPI	1,751	1,453	83.0
	Teacher questionnaire	PAPI	1,751	1,425	81.4

(continued)

Table 3 (continued)

	Instrument	Mode	Sample	Valid	Response rate in %
Wave 7	Child questionnaire	PAPI	2,001	1,344	67.2
	Competence assessment	PBT	642	526	81.9
	Parent interview	CATI	2,007	1,421	70.8
	Teacher–Child-Rating	PAPI	924	578	62.6
	Teacher questionnaire	PAPI	924	161	17.4
Wave 8	Child questionnaire	PAPI	1,912	1,071	56.0
	Competence assessment	PBT	600	442	73.7
	Parent interview	CATI	1,915	1,184	61.8
	Teacher–Child-Rating	PAPI	873	313	35.9
	Teacher questionnaire	PAPI	873	478	54.8
Wave 9	Adolescent interview	CATI	1,906	972	51.0
	Competence assessment	CATI	1,906	972	51.0
Wave 10	Adolescent interview	CATI	1,678	832	49.6
	Competence assessment	CATI	1,678	832	49.6
	Adolescent interview	CAWI	845	179	21.2
Wave 11	Adolescent interview	CATI	1,593	839	52.7
	Adolescent interview	CAWI	752	261	34.7

contexts, context effects can be analyzed. Some examples for such analyses are provided in Pfost et al. (this volume) and Karing et al. (this volume) of this volume. For instance, in a study by Pfost and Artelt (2013), the effect of attending the upper academic track school (Gymnasium) in comparison to lower and middle track school (Haupt-/Realschule) for reading development between Grade 5 and Grade 7 was analyzed. In another study, Schurtz et al. (2014) analyzed the complex interrelation between students' academic interests, competencies, and grades between Grade 5 and Grade 6. The empirical analyses were embedded within assumptions of the internal/external frame of reference model (I/E model; Marsh 1986) as well as the big-fish-little-pond-effect model (BFLPE; Marsh 1987). Third, Becker et al. (2017) explored the role of learning environments for students' goal orientation. Thereby, the development of students' mastery and performance goals between Grade 5 and Grade 11 was described and related to variables such as the transition from school to vocational training. Or fourth, Karing (2009) analyzed teachers judgement accuracy in reading respectively language

arts and mathematics. In her study, judgement accuracy was related to teacher and class characteristics or the whether the judgement refers to cognitive (students' competencies) or non-cognitive (students' interests) outcomes. However, besides analyses conducted by researchers within the BiKS research group, the BiKS-8-18 study still offers an extensive range of further possible analyses. For example, analyses that relate individual differences in academic competencies when children were in primary school to education decisions and pathways at the end of secondary school, including the transition into tertiary education, are still scarce.

Another strong emphasis in the BiKS-8-18 study was on the educational decision-making process of parents (and teachers), its surrounding activities, and the influence of social relations before and after the transition from primary to secondary school in Germany. Researchers from the BiKS group examined and compared differences of family background, family aspirations, family burden, family social networks, and institutional differences in the federal states of Bavaria and Hesse on educational outcomes (see Blossfeld et al. this volume): The parental educational aspirations are an essential factor in the decision-making process. Parental aspirations can be understood as representations of parents' expectations about their children's possible future educational pathways (Kleine 2014; Kleine et al. 2010, 2013). In addition, Luplow and Schneider (2014) and Luplow (2017) examined the role of tutoring by parents at home or through non-familial institutions during primary school years—as possible tools for parents to pursue their educational goals—on educational outcomes. Further studies addressed the influence of families' social capital and family burden on their children's educational success in their analyses (Kleine 2014; Kleine et al. 2013; Luplow 2017; Schmitt 2012; Schmitt and Kleine 2010; Schmitt and Sixt 2014). After the transition to secondary school, the revision and stabilization of previously made school transition decisions, especially with regard to differences in the school type choices in Bavaria and Hesse was analyzed (Zielonka 2017; Zielonka et al. 2013; Zielonka et al. 2014).

In sum, there is still plenty of potential in the data of BiKS-8-18 to further contribute to a better understanding of competence development, educational pathways, and decisions. This rich data set allows researchers to relate these educational trajectories with later transitions into university studies, vocation training

or work, taking into account individual differences between students and families from an earlier point in time. Due to its multidisciplinary perspective, the BiKS-8-18 study can still offer interesting empirical answers to open research questions. Furthermore, research that takes the complex interactions of different actors such as parents, teachers, and the student within different educational contexts and across different educational stages into account is still warranted.

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Appendix

See (Table A1).

Table A1 Explaining continued participation in the study

	W2	W3	W4	W5	W6	W7	W8	W10	W11
	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)	AME (SE)
Sex: Female (Ref. Male)	0.015	−0.005	0.002	0.012	0.007	−0.002	0.034	−0.023	0.060*
	(0.009)	(0.010)	(0.008)	(0.008)	(0.007)	(0.017)	(0.010)	(0.003)	(0.015)
Age in Months	−0.037	0.012	0.014	−0.018	0.023	−0.004	0.005	0.004	−0.015
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)	(0.002)
Federal State: Hesse (Ref. Bavaria)	0.001	−0.083**	0.012	0.004	0.025	0.302**	0.054*	−0.045	−0.030
	(0.009)	(0.012)	(0.009)	(0.009)	(0.007)	(0.015)	(0.010)	(0.004)	(0.016)
Socio-economic status (HISEI)	0.071*	0.062	0.015	0.115**	0.032	0.114**	0.003	−0.014	0.077**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Parent education (Ref.: University admission [Fach-/Abitur])									
Lower secondary [quali. Hauptschule]	0.010	−0.086**	−0.010	−0.010	−0.054	0.010	−0.073*	−0.036	−0.061
	(0.014)	(0.017)	(0.015)	(0.015)	(0.013)	(0.029)	(0.020)	(0.007)	(0.028)
Medium secondary [Mittlere Reife]	0.054*	−0.002	0.019	0.005	−0.009	0.008	−0.037	−0.034	−0.061*
	(0.011)	(0.012)	(0.010)	(0.011)	(0.010)	(0.022)	(0.012)	(0.006)	(0.020)

(continued)

Table A1 (continued)

	W2	W3	W4	W5	W6	W7	W8	W10	W11
Migration background (Ref.: Child and parents born in Germany)									
At least one parent or child born abroad	0.005	−0.035	−0.076**	0.005	0.005	0.022	0.036	0.022	0.035
	(0.011)	(0.014)	(0.012)	(0.011)	(0.009)	(0.021)	(0.011)	(0.004)	(0.019)
Adjusted R^2	0.004	0.020	0.004	0.013	0.003	0.103	0.008	−0.000	0.019
N	2395	2166	2076	1970	2691	2557	2477	1835	1751

Notes: Results from linear probability models to predict continued participation in the study; sample sizes represent the remaining participants from the previous wave; standardized average marginal effects, standard errors in parenthesis; * $p<0.05$, ** $p<0.01$

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