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## The German school system in the COVID-19 pandemic era

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### *Abstract*

This article reviews findings to date on the impact of the COVID-19 pandemic in the German school system and discusses selected topics, i.e., general conditions of teaching and learning, didactic design and methodology, and the effects on educational outcomes. Like many other countries, Germany had to close its schools several times and switch to distance or alternate-shift learning, although the measures implemented by the federal states in this respect differed by region. In what follows, we first identify seven phases in the chronological course the pandemic took in Germany across the various ‘Länder’, or federal states. Next, we turn to a discussion of the medium- to long-term development needs of the German school system, based on the empirical findings available to date. Here our focus will be on the following issues: Fostering students’ self-regulated learning, making up for students’ learning losses, with special attention to inequalities exacerbated by the pandemic, and digitalizing the school system. Lastly, we address the future development of concepts for linking synchronous and asynchronous (digital) forms of learning and their integration into classroom instruction.

### 1. Introduction

The COVID-19 pandemic has confronted states, governments, and populations worldwide with profound and oftentimes highly stressful challenges. School systems were no exception: to contain the infection, all OECD countries had to close their schools. To keep educating their students, schools needed to adapt (OECD, 2021a), which meant rapidly pivoting from the traditional in-person classrooms to distance learning (Steinmayr, Lazarides, Weidinger & Christiansen, 2021). This COVID-19 crunch situation moreover exposed weaknesses and inequities in many of the world’s school systems (OECD, 2021b). In Germany, discussions initially focused primarily on assuring and digitalizing instruction (Fickermann & Edelstein, 2020). Now, with the pandemic still not contained, the first empirical evidence is emerging for how

Germany managed the school system crisis and its potential effects. The data provide the starting point for the present article, which aims to present an empirically-based retrospective survey of changes wrought in the general German school system by COVID-19 and of the developmental needs for schools that the virus exposed. For the benefit of an international readership, we begin by outlining how the German school system is set up, how it is structured, and what its key parameters are (section 2). With this groundwork laid for understanding and evaluating the decision making by German education policy makers in response to COVID-19, we next trace the pandemic's key stages to summarize the inroads it made in the school system (section 3). This is followed by an overview and classification of selected empirical studies of the pandemic's impact on the general school system wherein we focus on studies of prevailing conditions, didactic design and methodology, and effects on educational outcomes (section 4). We conclude with a discussion of needed reforms laid bare by the pandemic (section 5).

## 2. The German school system

### 2.1 Federalism and split prerogatives between federal and state governments

In Germany, the federal government has only a limited say in the general education school system; its role is confined mainly to enforcing the provisions of the Basic Law dealing with state supervision of schools and the guaranteeing of equal educational opportunities. It is the 16 federal states instead that preponderantly run German schools (van Ackeren & Klemm, 2011) with sole responsibility for shaping and administering the general education system (Rürup, 2007). The states themselves in turn distinguish between internal and external school affairs: The former designate functions administered at the state level, the latter those managed by local governments. Thus, for example, developing curricula and textbooks as well as teacher training and remuneration are categorized as internal, while local authorities perform external functions such as hiring and paying non-teaching staff and managing the school facilities (van Ackeren & Klemm, 2011). This division of roles is mirrored by a consortium of state ministers of education and culture, formally designated the Standing Conference of Ministers of Education and Cultural Affairs of the States of the Federal Republic of Germany, abbreviated as KMK. Composed of ministers or senators from all 16 states, it is the highest decision-making body for the German education system, which forms part of its responsibility for maintaining equality in living conditions throughout Germany. This mission statement also translates into ensuring that education and culture are as uniform, comparable and equitable as possible throughout the country, thus entailing responsibility for schooling and training, higher education and research, and cultural affairs (KMK, 2015). The KMK ensures

“in matters of importance affecting all states ... the necessary degree of uniformity in education, science, and culture” (ibid., p. 7, translated by the authors). In the process, the common interests of all federal states are to be represented in the KMK. For example, it is also tasked with ensuring that graduation requirements and credentials are comparable and uniform throughout Germany. To these ends, the KMK issues recommendations, resolutions and agreements that provide a binding framework for the federal states (ibid.).

## 2.2 School system structure

In Germany, school attendance is compulsory from the ages of 6 to 18. At the primary level, the German school system provides for four years of elementary school; in Berlin and Brandenburg, however, this stretches to six years. This is followed by secondary level I, comprised of grades 5 to 10, and secondary level II, whose length varies from state to state and, in some cases, within states, from two to three years, as a consequence of several reforms over the past two decades (Huebener & Marcus, 2015). The secondary levels encompass different educational tracks, each having its own qualifications and academic standards (KMK, 2019a). Compared internationally, the German general education system thus selects students according to performance at an early stage (Döbert & Sroka, 2004; OECD, 2020; Nikolai, 2019; Wößmann, 2008). In addition, children with special needs attend schools focused one or more of the following areas: physical and motor development, emotional and social development, mental development, language, learning, hearing, and vision. These special schools cover grades 1 to 10 (KMK, 2019a). Germany in 2009 implemented the 2006 UN Convention on the Rights of Persons with Disabilities (United Nations, 2006) to which 177 countries worldwide currently subscribe. Since then, all students in Germany with special educational needs have the right to attend general and vocational schools. The resulting restructuring of the school system is still underway. Traditionally, secondary level I has included the *Hauptschule*, the *Realschule* and the *Gymnasium*. In many states, however, the *Hauptschule* has been phased out and in some cases replaced by other types of schools, such as the *Sekundarschule* in the states of the former East. Some states also operate the *Gesamtschule* or ‘comprehensive school,’ which comes in two flavors, either integrated or cooperative. The integrated type is attended by all students *en masse*, but they pursue different tracks according to the courses they take, i.e., either basic or advanced. In the cooperative variety, two or three school forms exist under one roof (KMK, 2019a). Here, the spatial proximity is intended to facilitate changing schools and to allow greater freedom of choice. The *Hauptschule* comprises grades 5 to 9, and in some cases grades 5 to 10; it generally leads to an (extended) secondary school leaving certificate. The *Realschule* lasts from the fifth to the tenth grade and ends

with the student earning the intermediate school leaving certificate, the *Fachoberschulreife*. The *Gymnasium* comprises grades 5 to 12 or 13 and leads to the general university entrance qualification; *Gesamtschulen* can comprise grades 5 to 10 or 5 to 12 or 13. In the latter type, any qualifications of the structured school system can be obtained (van Ackeren & Klemm, 2011; KMK, 2019a), i.e., the *Hauptschule* school leaving certificate, the intermediate school leaving certificate, the advanced technical college entrance qualification and the general higher education entrance qualification. The *Hauptschulreife* and *Realschulreife* traditionally allow students to start vocational training; the *Allgemeine Hochschulreife* lets students move on to university studies; the *Fachhochschulreife* is a vocational qualification that can be obtained after 12 years of schooling at a *Berufsfachschule* (vocational school) or a *Fachoberschule* (technical high school) and leads to studies at a *Fachhochschule* (post-secondary technical college) (KMK, 2019a). The above-mentioned school-leaving qualifications can also be obtained at second-chance schools, such as night schools. In the 2017 school year, Germany's student population totaled 10,837,182 students, with 8,346,856 students enrolled in general education schools and 2,490,326 students attending vocational schools (KMK, 2019b). In addition to public schools, the German school system also allows private schools, which can be divided into two types. The first are the alternative schools. They are operated by independent, non-public organizations that correspond to the public school types and can be attended in place of public schools. In principle, they offer the same curricula as the latter. By attending an alternative school, students fulfill their legal compulsory schooling requirements. The German school palette is rounded out by independent supplementary schools that offer curricula not taught at either public or alternative schools. They are often found in the vocational area for apprentice training, but in general education also include international schools, for example (Hornberg, 2021; Ullrich, 2019).

The grades students earn and which figure prominently in everyday school life, especially in the context of tests and report cards, form the basis for graduation. The German school system predominantly uses number grades, which, however, have come in for increasing criticism in recent years. They range from 1 to 6, with a 1 ('very good') representing the top grade and a 6 ('unsatisfactory') representing the bottom (Winter, 2015). On the secondary *Gymnasium* level, a 15-grade point system is used instead of numerical grades (Bosse, 2019). Generally, students in third grade and above take home a numerical report card at the end of each school semester with grades in each subject (Winter, 2015; Jürgens & Lissmann, 2015). These reports are the basis for whether a learner gets promoted to the next grade or moves on for admission to subsequent educational programs (Winter, 2015).

### 3. The chronology of the pandemic and how it impacted schools

The COVID-19 pandemic manifested itself in Germany from March 2020 onward (see also Fickermann & Edelstein, 2020, 2021a; Reintjes, Porsch & im Brahm, 2021a for the first part of the chronology). Both the effects of the pandemic and the measures taken by the German states to combat it differed from region to region. As we lack the space to go into detail here, in what follows instead of focusing on the individual developments in the states we concentrate on seven phases we identified as nationwide in character through October 2021. For this purpose we relied on press releases of the German federal government and the KMK with a focus on the impact on the German school system. The timeline of the seven phases identified below reflects the major changes (e.g., school lockdowns and changeover to distance learning, (partial) reopening of schools for face-to-face instruction, etc.) that punctuated the pandemic's course.

#### *Stage I (mid-March to end-April 2020): nationwide school closures (first lockdown)*

In response to the spread of the SARS-CoV-2 virus and the resulting exponential increase in COVID-19 cases during the so-called first wave, schools were closed throughout Germany from mid-March 2021 (Fickermann & Edelstein, 2020). Among measures taken to slow down the spread of the SARS-CoV-2 virus were sweeping contact restrictions (Bundesregierung, 2020a, 2020b). These resulted in schools being closed to most students for in-person classes; only children of parents in system-relevant occupations were eligible for attending emergency care facilities. Compulsory education was suspended, but students were to be assigned lessons for completion at home (Reintjes et al., 2021a).

#### *Stage II (end of April 2020 until end of the school year): gradual opening of the schools for face-to-face and alternate shift classes, with a continued high proportion of distance learning*

In mid-April 2021, the KMK (2020a) presented a 'Framework Concept for the Restart of Classes in Schools,' which was adopted at the end of April (ibid.) for implementation by the states (Bundesregierung, 2020d). Beginning on April 20, 2020, the states moved to reopen schools for in-person instruction, varying by school type, grade, and state, while observing protective and hygienic measures such as separated smaller learning groups, distancing regulations, hand washing, disinfection, and ventilation (ibid.; KMK, 2020a). However, by no means did this mean that in-person instruction was resumed for all students. Instead, it was an arrangement reduced in form and scope for selected grades, supplementing at-home learning (KMK, 2020a). The in-person program initially focused on students "in the upper grades and

graduating classes of general education and vocational schools scheduled to take their exams in the next school year, as well as those in the last grade of elementary school” (Bundesregierung, 2020c, n.p., translated by the authors). Likewise, exams of the senior classes, e.g., the Abitur, and corresponding exam preparations were to be held (ibid.; KMK, 2020a). Starting in early June, the first states opened elementary schools completely, with the other states gradually following suit. However, up until the start of summer vacation, the majority of lower secondary school students in particular received in-person teaching only a few days per week at most.

*Stage III (August to mid-December 2020): full opening of schools, taking into account hygiene measures and local infection rates*

With the start of the 2020/2021 school year, a modified regular attendance schedule was introduced in the schools for all grades so that, with due regard for hygiene measures such as ventilation, cleaning, and masking, all students would receive regular in-person classroom instruction without the previously applicable classroom distancing rules (KMK, 2020c; Reintjes et al., 2021a). However, that still left individual students, teachers or classes unable to participate in regular classroom instruction due to the upticks in the disease or under prescribed quarantining measures. In some cases, complete closures also were effected due to the virus outbreaks in schools (Reintjes et al., 2021a). At the same time, further measures by the federal government – such as providing better broadband access, IT equipment and support, software and new tech competence centers – were adopted to aid the individual states in digitalizing their schools (Bundesregierung, 2020e).

*Stage IV (mid-December 2020 to mid/late February 2021): nationwide school closures (second lockdown)*

Germany experienced another exponential surge in infection numbers in the fall/winter of 2020/2021 (the so-called second wave), which once more triggered nationwide school closures (Reintjes et al., 2021a). Simultaneously, lockdown measures were adopted to curb the latest outbreak. With respect to the school sector, it was initially decided to keep schools open as long as possible, in line with the local infection rate (Bundesregierung, 2020f, 2020g). Nevertheless, in mid-December, in addition to further pandemic-related restrictions on public life, it was agreed to extend the Christmas vacations from mid-December to January 10, 2021, and to suspend in-person classes or to close schools to reduce contacts before Christmas (Bundesregierung, 2020g; Reintjes et al., 2021a). Subsequently, after the Christmas vacations and until mid-February, the switch to distance learning was also made nationwide while compulsory school attendance was suspended (Bundesregierung, 2021a, 2021b). This renewed shift to distance-only learning was prompted by the failure to achieve the goal

of a 7-day incidence of less than 50 new infections per 100,000 inhabitants and because of the inroads the more contagious ‘Alpha’ variant B.1.1.7 of the SARS-CoV2 virus was making among children and adolescents (Bundesregierung, 2021b).

*Stage V (mid/late February to mid-April 2021): gradual reopening of the schools for in-person and alternating shift classes*

In mid-February 2021, the German government, jointly with representatives of the states, decided to gradually reopen the schools, while observing protective and hygienic measures (masks, ventilation, rapid testing strategy) (Bundesregierung, 2021c). In the run-up to implementation, the KMK already in early January had emphasized the importance of in-person teaching for students, including for fostering social interaction, and had drawn up a set of recommendations for reopening the schools. First, grades 1–6 and graduating classes would return to in-person classes and final exams should take place. Depending on the rate of infection, face-to-face teaching could then be gradually expanded to the other grades (KMK, 2021a, 2021b, 2021c). In addition, starting on December 27, 2020, Germany began vaccinating the adult population by priority categories (Bundesregierung, 2021a) which included assigning a priority to getting vaccines into school employee arms (Bundesregierung, 2021d). Consequently, from March 2021 on, vaccination was first offered to staff at primary, special education and special needs schools, followed by staff at the remaining schools. In addition, with rapid tests available by then, the gradual opening of schools could be conditioned on a testing strategy for school employees and students (Bundesregierung, 2021d, 2021e; KMK, 2021b). In accordance with the states’ primary role in managing the schools, the federal government left it up to the states when to open schools for face-to-face teaching and implement the necessary hygiene measures (Bundesregierung, 2021c). Hence, there was no uniform national approach in this regard.

*Stage VI (from mid-April 2021 until the end of the school year): uniform federal regulations for distance-, shift-, and in-person learning in light of local infection caseloads were issued – the so-called ‘emergency brake’*

With a third wave of new infections starting to sweep through Germany in late March 2021, a law promulgated on April 23, 2021 set uniform federal infection control regulations. This law was designed to replace the heavily criticized jumble of measures implemented by the states. It imposed unprecedented nationwide mandates on the education sector, including testing for teachers and students as a prerequisite for holding in-person classes. It also required switching to alternating classes if the 7-day incidence rate exceeded 100 cases in a county or independent city, and it prohibited in-person classes (with the exception of graduating classes and special needs



schools) if the 7-day incidence exceeded 165 cases (BGBL, 2021). Thus, it is difficult to reconstruct if and to what extent students received distance, alternating, or exclusively in-person instruction because of being linked to the respective local infection incidence in Germany's 401 counties and independent cities. From late April 2021, the incidence of new infections started decreasing; by mid-May, the nationwide average had dropped below 100, and by month-end, all states had watched their average 7-day incidence decline to under 100 (RKI, 2021). Therefore, it can be surmised that, after the previous stages of distance and alternating learning, on average regular in-person instruction could be resumed for most students of all grades only from this point on, and with due observance of protective and hygienic measures (such as mandatory masking and testing).

*Stage VII (from August 2021): regular operation for school year 2021/2022*

Since the start of the 2021/2022 school year, regular school operations have been restored for all students, so that full and regular in-person classes in all school subjects as well as all school and extracurricular activities, school trips and exchange programs could resume (KMK, 2021d, 2021e, 2021f). The health protocols in effect are guided by the infection rates and are adjusted as needed (e.g., mandatory use of masks; installation of air filters; increase in the mandatory number of weekly rapid tests for schoolchildren). These measures, as well as the vaccination program for children aged 12 and older introduced at this time (see Bundesregierung, 2021f) are intended to help keep the schools open despite a potential seasonal surge in the number of infections in the fall/winter of 2021/2022. Thus, the KMK (2021f) formulates as a goal that "school closures ... should be avoided as much as possible and as few students as possible should be quarantined" (ibid., n.p., translated by the authors).

#### 4. Impact and challenges of the pandemic

As outlined above, with policy measures undergoing constant adjustment as the pandemic unfolded, implementing the torrent of new regulations – at times on short notice within a matter of days – proved to be a continual challenge for the schools. The first pandemic-related school closure in Germany in March 2020 (phase I), an unprecedented political decision for the school system, caught them unprepared. The nationwide distance learning imposed was also a first for Germany, so they had no existing concepts for school closures and digital instruction to draw on. During the second round of school closures in 2021 (phase IV), schools could already fall back on experience from the first lockdown, but that does not mean that schools were ready for a school lockdown lasting several months. The following section summarizes selected impacts on teaching and learning in schools during the pandemic in

Germany, from the empirical evidence. Below, we focus on empirical findings on selected topics, i.e., general conditions, didactic design and methodology, and the effects on educational outcomes.

#### 4.1 General conditions

We begin by examining the changes to the framework conditions for schooling in Germany and the challenges they posed. Empirical studies on pandemic distance learning show that during the spring of 2020 school closures (Stages I & II), establishing communication channels between the school and the students proved to be the key issue initially. This emerges, among others, from the systematic overview of the literature on distance learning by Helm, Huber, and Loisinger (2021). Their review of 97 online surveys of school administrators, teachers, parents, students, and others in Germany, Austria, and Switzerland indicated that during distance learning many schools initially faced the problem of how to connect with students. The majority used digital media for this purpose (*ibid.*). Another difficulty was that in Germany neither teachers nor students had access to school computers (cf. e.g., S-CLEVER-Konsortium, 2021). The lack of suitable technology in good working order meant that both teachers and students had to resort to using personal hardware. In this first phase of school closures, it has been shown empirically that all students still did not have access to personal computers (cf. Helm, Huber & Loisinger, 2021). Given these deficits the possibilities for distance learning were limited. An additional complicating factor in some cases was the lack of adequate software, so that it was left up to the schools to select and install learning management systems and communication software (see, e.g., the results of the survey study on the state of North Rhine-Westphalia by Forell, Philipp & im Brahm, 2021). Implementing digital solutions as well as the resultant high workloads were also shown empirically to confront teachers with severe challenges (S-CLEVER-Konsortium, 2021). As noted in section 2.2, education policy measures to expand digitalization were therefore implemented. They included the federal and state governments providing funds to teachers and students, who have no access to a pc or laptop at home, for acquiring laptops for home use (see <https://www.digitalpaktschule.de>). However, it cannot be shown empirically that the equipment was already widely available by the time of the early 2021 school closures. However, even if the technical infrastructure was in place, it became apparent that teachers' different skill and experience levels hobbled the switch to almost universal digital teaching at a distance. This emerged clearly from international comparisons (cf. the findings of Eickelmann, Bos & Labusch, 2019), which showed that prior to the pandemic the use of digital media in subject teaching was relatively rare in Germany, as was the use of digital learning platforms. Indeed, the majority of teachers at the time had comparatively little experience with digital

learning methodologies (S-CLEVER-Konsortium, 2021). The need to promote media skills among teachers was therefore already manifest before pandemic-related distance learning became a necessity, as can be gathered from the ICILS international comparative study (cf. Eickelmann et al., 2019). As other empirical studies revealed, the combination of a technology deficit and the uneven experiences and skills of teachers with digital media in the classroom in Germany impacted lesson design.

## 4.2 Didactic design and methodology

The changeover to distance or alternating instruction due to (partial) school closures (cf. section 2.2) led to significant pedagogical changes. No longer confined to the living classroom, lessons were now taught at a distance via other communication channels, while all participants were at home. Because both oral and written communication are key elements in the classroom (cf. Breidenstein, 2010), this section starts with an examination of the current state of research on teacher-student communications.

To summarize, the empirical literature shows that pandemic-related distance learning in Stages I and II mainly relied on written work materials, which were generally provided to students via e-mail or on learning platforms (cf. Steinmayr et al., 2021; Eickelmann & Drossel, 2020; Lorenz, Lepper, Brüggemann & McElvany, 2020). Video conferencing as a communication medium was rarely used (cf. e.g., Lorenz et al., 2020; Steinmayr et al., 2021; Züchner & Jäkel, 2021). In contrast, by the time of the school closures in early 2021 (Stage IV), a wider spectrum of communication channels had come into use: A survey of parents by Wößmann et al. (2021) at the beginning of 2021 ( $n = 2,112$ ) showed that 61% of the students received classroom instruction (e.g., via video call) more than once a week, and some 25% did so daily. When queried about the use of other communication channels, 97% of parents responded that teachers assigned their children homework at least once a week, and 65% stated that this was a daily occurrence. Some 82% cited “watching educational videos or reading texts” as taking place at least once a week, while 62% of respondents reported the use of educational software or programs at least once a week (*ibid.*).

In terms of subjects, the nationwide parent survey ( $n = 4,230$ ) conducted by Wildemann and Hosenfeld (2020) for the spring/summer 2020 school closures (Stages I & II) shows that assignments were primarily made in the subjects of German and mathematics in both primary and secondary schools. At the secondary level, following the parents’ information, additionally more stress was placed on the subject of English (*ibid.*). As another survey of school administrators in North Rhine-Westphalia showed (im Brahm, Reintjes & Görich, 2021), the main subjects were also the focus in most elementary schools after the schools reopened for partly in-

person teaching at the end of the 2019/20 school year (Stage II). For the secondary schools, on the other hand, a more differentiated picture emerged: the partially resumed but still limited face-to-face teaching was mainly reserved for the major subjects, but in some cases also for minor subjects (*ibid.*). Teachers already transmitted instructions to students during distance learning in the spring and summer of 2020 (Stages I & II); and the majority of students also confirmed that teachers monitored learning tasks (*cf.* Helm, Huber & Loisinger, 2021). According to Anger and Sandner (2020), effective learning in distance courses requires regular contact between teachers and students. This, however, could not be achieved in practice: For distance learning in the school year 2019/2020 (Stages I & II), only every fifth to every second student reported having regular teacher contact (*cf.* in overview Helm, Huber & Loisinger, 2021). As several studies show, this apparently was due less to a lack of access to teachers (*cf. ibid.*) than to who initiated and maintained contact between teachers and students. It could be the case, that this is the decisive factor in communications between the two groups as for teachers to take more initiative in this area was wished for by the parents (*cf. e.g.,* Huber et al., 2020; Wildemann & Hosenfeld, 2020) and nearly half of the students surveyed in the first phase of school closures also wanted more support from teachers (Letzel, Pozas & Schneider, 2020). Tellingly, the review by Helm, Huber, and Loisinger (2021) shows that when interactions between teachers and students did take place, parents and students alike largely perceived this as positive (see also Huber et al., 2020). In early 2021, a repeat survey of parents yielded comparable results on contact frequency (*cf.* Wößmann et al., 2021): 41% of parents provided feedback that their child had individual conversations with teachers at least once a week during this period, while 32% reported that no individual conversations (via video call or phone call) had ever taken place (*ibid.*). From these findings, Wößmann et al. (2021) conclude that a key challenge of distance education continues to be providing adequate support to students. The effects of distance teaching on the learning processes of the students will be highlighted in the next section.

### 4.3 Effects on educational outcomes

When it comes to learning processes and successes as well as nascent pandemic-related learning deficits in Germany, only a few studies have been published to date, primarily on the first school closure in spring 2020 (Stages I & II) (*cf.* Helm, Huber & Postlbauer, 2021; Helbig, 2021). They make it clear that distance learning led to considerable reductions in learning time: students spent an average of up to four hours less per day learning (*cf.* Helm, Huber, & Postlbauer, 2021; Nusser, Wolter, Attig & Fackler, 2021). This means that the average learning time of students in Germany was cut in half (Middendorf, 2021). Huber and Helm (2020b) also showed

that the learning time of individual students varied greatly: while some only studied up to two hours a day, others spent five or more hours a day over their lessons. Students were more likely to be in the latter group if they possessed an elevated level of self-regulation skills and ability to organize their day. In terms of distance learning efficacy, Middendorf (2021) argues that both the amount and quality of learning time must be given due weight.

In fact, some students thrived under distance learning: Huber et al. (2020) found that, measured by the ‘School Barometer’, roughly a quarter of the students stated that they derived more benefit in distance learning. One of the reasons they cited was having the ability to organize their time themselves to suit their own biological and learning rhythms. Learning at your own pace was also mentioned in the open-ended question as a reason for increased learning. This advantage was not only noted by higher-performing students – who no longer felt slowed down by lower-performing students – but also by students generally who reported that “by working at their own pace, they would feel less time pressure, could absorb the lesson content more easily, and could go back over the material individually” (Huber et al., 2020, p. 49, translated by the authors). Also pointing in this direction, at least in some cases, are the results of a parent survey on distance learning conducted during the second school closure at the beginning of 2021 (Stage IV): Here, 22% of the parents stated that their children learned more at home than at school. On the other hand, the majority of parents surveyed (56%) believed that their children were learning less at home than in the classroom (cf. Wößmann et al., 2021).

Empirical studies on distance learning consistently dwell on its pronounced drawbacks for disadvantaged students (cf. Helm, Huber & Postlbauer, 2021; Steinmayr et al., 2021). With schools no longer providing the necessary learning support, parents had to step in to fill the void while still going to work – that is, assuming they had adequate resources at home for mentoring the children. Based on a parent survey (n = 1,662), Thorell et al. (2022) estimate that in spring/summer 2020 (Stages I & II) students had a parent by their side an average 34% of the time the students spent in distance learning. This percentage also vividly illustrates the additional burden the school closures imposed on parents. How disparate the at-home arrangements were is reflected in the analyses of a parent survey in North-Rhine Westphalia (n = 6,685) by Sander, Schäfer, and van Ophuysen (2021): The more time parents spent at their jobs, the fewer opportunities they had for managing the at-home learning environment for their children. Family socioeconomic background also correlated negatively with structured support at home (ibid.). Findings such as these made the issue of educational inequity created by distance education – especially for students from socioeconomically disadvantaged families – part of the public discussion (cf. Frohn, 2021; Hammerstein, König, Dreisörner & Frey, 2021; Reintjes, Porsch & im Brahm,

2021b; Zierer, 2021). In this context, the data presented by Sander et al. (2021) however point in another direction: the socioeconomic status of the parental home can only explain a small part of parental learning support. Their analyses suggest a significantly higher correlation between parental learning support and how the parents gauge the learning support the child receives in school – but also the child’s own attributes (such as age and gender). Sander et al. (2021) interpret the results in terms of adaptive parental support behavior.

Due to the limited learning support, skills in self-regulated learning are of particular importance in the context of distance learning, given that this is usually a highly personal form of learning with an extremely low proportion of external intervention by the teacher (Fischer, Fischer-Ontrup & Schuster, 2020). For example, Thorell et al. (2022) estimate from their parent survey that students in Germany during the first lockdown were left to their own devices during distance learning an average 55% of the time. Many students in these open distance learning situations often lacked the necessary skills to learn successfully (Fischer et al., 2020). Research findings further show the varying degrees to which students are capable of dealing with independently organized learning situations: Lipowsky (1999) observed in a quantitative study of open learning situations that students with poorer concentration have more difficulties in using learning time and need more support from the teacher. This challenge was also evident in distance learning in early 2021, when 59% of parents reported that their child was learning independently at home. However, they indicated that 42% of students often struggled to learn in that setting. Parents of lower-performing students also reported more frequently than did parents of higher-performing students that they viewed their children’s learning to be less effective (Wößmann et al., 2021). In-depth analyses by Huber and Helm (2020a) of the ‘School Barometer’ data also highlight the importance of self-regulation in distance learning. They conclude that the perceived low learning success of students with few resources at home was less correlated with a technology gap or low parental support than with a lack of skills in self-regulated learning and self-organization of daily routines.

Against this background, a look at the first extant research findings on the actual learning successes of students in the pandemic-induced distance learning context is instructive. However, first let it be noted that so far we possess only five studies for Germany that investigated student learning outcomes based on school performance tests (Deppling, Lücken, Musekamp & Thonke, 2021; Förster, Forthmann, Holl, Back & Souvignier, 2021; Ludewig, Kleinkorres et al., 2022; Schult, Mahler, Fauth & Lindner, 2021; Spitzer & Musslick, 2021). The sparse research available does not allow us to draw a consistent picture for Germany: There is evidence on the one hand suggesting reduced learning outcomes with distance learning and, on the other hand,

that no such losses occurred – or that in some cases even improved learning happened (see Hammerstein et al., 2021, for an overview; Helm, Huber & Postlbauer, 2021; Zierer, 2021). A representative study conducted in 2021 of elementary schools in Germany that had participated in the 2016 Progress in International Reading Literacy Study (PIRLS) showed that the average reading proficiency of fourth-grade children was significantly lower than in 2016 (even after controlling for possible changes in the student body). The drop corresponded roughly to missing four to six months of learning time (Ludewig, Kleinkorres et al., 2022). In addition, the study found that the proportion of proficient readers decreased while the number of low-performing fourth-grade readers increased (Ludewig, Schlitter et al., 2022). Studies that demonstrated increased student learning successes provide initial indications of potential distance learning success factors: an investigation of online learning environments by Spitzer and Musslick (2021) showed higher learning gains in mathematics for students doing distance learning. In this case, the students with the weakest performance recorded the highest learning gains. The learning software in use permitted adaptive learning support by assigning different tasks to the students tailored to their learning levels. Other studies on the use of adaptive learning software conducted outside of Germany point in a similar direction (cf. Hammerstein et al., 2021). Nevertheless, there remains a considerable need for further research in this area. For example, there are no studies available in Germany on the minor subjects that presumably received less of a focus during the school closures (cf. section 2.3.2). Neither do we have any meaningful studies on performance trends in the grades that were subjected to the longer distance learning phases in Germany – nor are there any analyses of the effects of the second school closures in 2021 that lasted several months.

For the overview provided in this section, we considered the perspectives of different actors involved, by drawing on existing results of surveys of school administrators (e.g., im Brahm et al., 2021; S-CLEVER-Konsortium, 2021), teachers (e.g., Eickelmann & Drossel, 2020; Lorenz et al., 2020), students (e.g., Letzel et al., 2020; Züchner & Jäkel, 2021), and parents (e.g., Nusser et al., 2021; Sander et al., 2021; Steinmayr et al., 2021; Thorell et al., 2022; Wildemann & Hosenfeld, 2020; Wößmann et al., 2021), as well as on findings from metareviews (e.g., Hammerstein et al., 2021; Helm, Huber & Loisinger, 2021; Helm, Huber & Postlbauer, 2021; Zierer, 2021). As Fickermann and Edelstein (2021b) observe in an overview of research on schooling and Corona, these activities relied heavily on ad hoc samples, due to the brief period over which the research field emerged. These samples therefore are not representative and, in some cases, fail to control for self-selection processes. This can result in social bias effects, because parents with low educational attainment are significantly underrepresented in the samples of some parent surveys

(e.g., in the studies by Sander et al., 2021; Steinmayr et al., 2021; Wildemann & Hosenfeld, 2020) so that their perspectives cannot be adequately represented. In light of this, the previously presented research findings must be regarded as being qualified. There remains thus a considerable need for research using representative samples of all stakeholders in Germany.

## 5. Discussion and conclusion

An overall assessment of the general school system in Germany during the COVID-19 pandemic shows that the school closures precipitated had a direct impact that urgently needs mitigating. In addition, longer-term effects on the educational and life trajectories of the affected students can be discerned. For example, Anger and Sandner (2020) showed that school closures in an international context in recent decades had consequences for the later working lives of the affected generation, including lower educational achievement or loss of income. For example, students in the graduating classes affected by the COVID-19 pandemic could be disadvantaged by having to prepare for final exams mainly in distance learning, forfeiting the chance of catching up on the missed material in later school years (*ibid.*). For Germany, very little empirical research has been conducted to date on student academic performance in real-time distance learning and any deleterious educational handicaps arising from it, especially for students from socioeconomically disadvantaged families (cf. section 2.3.3). There is also a dearth of nationwide representative studies as well as research on the much longer-lasting school closures in early 2021 (Fickermann & Edelstein, 2021b; Helm, Huber & Postlbauer, 2021). However, the findings on the social and psychological effects for the upcoming generation suffice to show a significant need for action when it comes to addressing the long-term consequences of social isolation as a result of lockdown, school closures, etc. (cf. Langmeyer, Guglhör-Rudan, Naab, Urlen & Winklhofer, 2020). For the post-COVID-19 pandemic period, the school system will therefore need to alleviate the effects mentioned above and provide appropriate support for the individuals affected. Education policymakers have already approved and provided initial financial support, such as for the action program ‘Catching up after Corona’ (BMBF, 2021; KMK, 2021c), designed to compensate for learning deficiencies and to promote extracurricular sports, social and cultural activities (BMBF, 2021). In the short to medium term, schools will therefore have to focus on addressing pandemic-related educational deficits and on making up for possible losses in terms of students’ performance and social development. In the longer term, the experiences during the COVID-19 pandemic point to future developmental needs of schools. As demonstrated by the empirical findings cited above, the action list includes key tasks like designing adaptive learning opportunities, supporting



students' learning in the classroom, and promoting self-directed learning skills. Although these particular issues had already been studied in depth before the pandemic in Germany, they now should receive heightened priority. The digitalization push fanned by the pandemic offers starting points for boosting the quality of classroom instruction in these areas. Pedagogical research (Klieme, 2020; Voss & Wittwer, 2020) has shown that high-quality teaching hinges in particular on underlying structures, i.e., on the cognitive activation of students, their constructive support, and efficient classroom management. It is precisely in these areas that distance learning has revealed considerable shortcomings (ibid.). For instance, most of the learning materials were not adapted to students' individual learning stages (cf. Huber et al., 2020), which stalled cognitive activation of the students at many points (Voss & Wittwer, 2020). Moreover, because teachers could only observe the individual learning progress of their students 'from a distance' (cf. also Sonnenburg, 2022b), it impaired their ability to support students' learning in real-time remote and alternating class contexts. The research shows that diminished direct communications between teachers and students (cf. section 2.3.2) complicated the provision of continuous constructive support. With structuring diminished if not absent, the students had to resort more to self-regulation skills. Where these were inadequate, learning at a distance was necessarily perceived as problematical (cf. section 2.3.3). Given this background, in the future more attention should be paid to deep structures in face-to-face teaching so as to improve the quality of teaching in general and thereby also compensate for the effects of school closings on the students.

The empirical findings on distance learning suggest that students perceived it as beneficial if they felt that they were actively shaping their learning processes (see section 2.3.3). Surveys of German school administrators have shown that they view empowering students to take more responsibility for their learning processes as a key response to the pandemic (S-CLEVER-Konsortium, 2021). As demonstrated by discourses on the promotion of self-regulated learning (Rolff, 2010), it is wrong to assume that students possess the skills required to take responsibility for their own learning processes; instead, they must acquire them with the guidance from and support by teachers. One possible approach to offering adaptive learning support for students and promoting self-regulated learning is by using digital media in face-to-face teaching. However, the findings on technical difficulties associated with digitally supported distance learning during the pandemic underscore the need for Germany to catch up in this area – a fact that had already been demonstrated pre-pandemic by the ICILS 2018 international comparative study (cf. Eickelmann et al., 2019). During the pandemic, the initial focus was on getting IT equipment to the schools and stakeholders (Bundesregierung, 2020e; KMK, 2020b). In distance learning, the use of digital media became the rule, and in the course of the school closures

in early 2021, the use of communication and learning software expanded (see section 2.3.1). Decisive for the future will be in what form the digital media evaluated during this period can be gainfully integrated (with modifications) in the students' learning processes in in-person classes. The study by Spitzer and Musslick (2021) indicates that digital learning environments can help teachers lend students adaptive support. In addition, there is the possibility – also in keeping with the demand for greater digitalization of schools (cf. Eickelmann, 2018, among others) – of integrating digital media into regular classes. How-to videos, learning management systems, digital lesson plans, or adaptive learning programs could also be used in the regular classroom to give teachers more time for individualized learning support and student development (cf. also Sonnenburg, 2020, 2022a). The future therefore will revolve around incorporating the experience gained with digital media during the pandemic into regular classes. This should not only consider the advantages of distance learning (such as learning at one's own pace or without the classroom hubbub) but also factor in the risks (such as reduced social learning and less structuring by the teacher) and pay heed to the digital media skills already acquired by all those involved in schooling. Hence, the impending challenge will be to transfer the experience and knowledge gained in working with digital media during the pandemic to the post-pandemic era – and to develop new concepts for linking synchronous and asynchronous forms of learning and integrating them into the regular classroom.

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