

Schooling in the Nordic countries during the COVID-19 pandemic

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Abstract

This article provides an overview of the extent of school closures and the use of distance learning in the Nordic countries during the COVID-19 pandemic (March 2020 to June 2021). Taking the preparedness of the educational systems into consideration and combining several reports summarising student and teacher experiences with research on the causal impact of distance learning, we discuss expected and revealed effects on student outcomes in the short and long term. Survey evidence indicates that the Nordic education systems were relatively well-prepared for a transition to distance learning in terms of access to digital technology. Overall, Sweden stands out as having kept compulsory schools open to a greater extent than the other countries, while policies put in place at the upper secondary level were more similar across the region. The literature suggests that school closures can be expected to have long term negative effects on skill formation and future earnings and that the negative impacts are likely to be larger for more disadvantaged students and larger the younger the students are when exposed to remote instruction. Given the extent of school closures, students in compulsory schooling in Norway, Finland and Denmark seem particularly vulnerable as do disadvantaged groups of upper secondary school students in all of the countries, since they have been exposed to distance learning for the longest periods. The size of the long-term effects will eventually depend on the success of policies put in place to counteract the potential negative effects.

Keywords: school closures, distance learning, COVID-19, student performance
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1 Introduction

Schooling is the most important public policy tool available for raising skill levels, and ample evidence exists of the positive impacts of enhanced skills and abilities on subsequent labour market attachment and trajectories. In countries like those in the Nordic Region, where education is free and universal, and where quality differences between private and public schools are small, schooling is also a major tool to enhance social mobility. The COVID-19 pandemic has implied a huge shock to education systems worldwide. Most governments have taken the precautionary measure of closing schools and initiating remote teaching to help reduce the spread of the virus. School lockdowns are likely to have had a considerable impact on how much students have learned with potential long-term consequences, as has been pointed out and assessed in a number of studies (e.g., Hanushek and Woessmann 2020; Kuhfeld, Soland, et al. 2020; Psacharopoulos et al. 2021). The measures put in place have varied across countries, and so has the preparedness of the education systems to handle a shift to remote learning. In this article, we take a closer look at school closures and the use of distance learning in compulsory and upper secondary schools in the Nordic countries (Sweden, Norway, Denmark, Finland, and Iceland) during the initial phase of the COVID-19 pandemic (March 2020 to June 2021).

In light of the preparedness of the education systems and various reports summarising the recent experiences from the educational sectors in the region, we discuss the expected impact of distance learning on student outcomes in the short and long term. We draw both on research conducted before the pandemic on the effects of distance learning and school closures on student performance, and on the few recent studies of how COVID-19 has affected learning outcomes.¹ We primarily include studies from the Nordic countries and studies from countries with similar education systems and levels of preparedness for remote teaching. However, research from other international contexts is brought up in certain discussions. For example, the most reliable studies on the impact of distance learning conducted before the pandemic are from the US. It should be noted that new research on the impact of the COVID-19 pandemic is still being compiled and released at the time of writing. We have tried, as far as possible, to include studies published up to the end of 2021. The compilation of knowledge presented in this article can serve as a guide to policy makers, suggesting areas to emphasise when developing policies to counteract the potentially multiple negative effects of school closures on student learning.²

The pandemic has been an unprecedented event and, of course, any predictions of the future are tentative. To investigate the effects of schooling conditions today on future outcomes, we could model how outcomes are likely to develop under different assumptions based on previous

¹ We only include studies based on objective learning measures, i.e., not based on teacher assessments.

² See Werner and Woessmann (2021) for a study with a similar ambition but focused on Germany.

research. Some studies already employ this approach (e.g., Fuchs-Schündeln et al. 2020; Hanushek and Woessmann 2020). Here, we focus less on quantifying possible effects. Rather, we discuss potential implications of school closures and remote learning for students' learning environments and how children in different age groups and from different socio-economic backgrounds may be affected.

In an international perspective, the Nordic countries, with the exception of Sweden during the start of the pandemic, have had among the lowest incidence of deaths among advanced economies.³ In many regards, the Nordic countries have taken similar actions. For example, all countries permitted (even encouraged) outdoor activities, such as exercising and going for walks. In comparison with most other advanced economies, they prioritised the return of pupils to school, particularly the youngest ones, above the return to work. However, there are also clear differences in policy between the countries. For instance, Sweden adopted a less interventionist proactive approach to the pandemic in comparison to its neighbours, and as we shall see, this included policies in the education sector. Accordingly, it is interesting to discuss to what extent the experiences are similar in the various Nordic countries, and whether the expected impacts are likely to be the same. Although this article does not represent a systematic and pervasive comparative study, we allow ourselves to discuss these matters to some extent.

We limit the focus of this article to a discussion of possible and revealed effects of school closures and remote teaching on student learning, although the pandemic is likely to have impacted school children and their families in a multiplicity of ways. Our intention is to discuss how student learning is likely to have been impacted by receiving education in the home compared to attending school as usual. We leave it to others to investigate whether decisions regarding how to organise teaching during the pandemic were important for the spread of infection, parents' ability to work, health issues, etc., and the effects of these factors on children in the long term.

This review is structured as follows: In Section 2, we define distance learning and discuss how it might impact student learning. In Section 3, we describe when schools in the Nordic countries have been opened and closed, and to what extent distance learning has been used, during the period March 2020 to June 2021. Section 4 focuses on the experiences of providing remote teaching during the pandemic in the Nordic countries. This discussion is based on descriptive reports, primarily survey studies, from the various countries. In Section 5, we present an overview of international research on the causal effects of distance learning on student performance. The greater part of this research has been conducted before the pandemic. In Section 6, we broaden our perspective by covering lessons that can be drawn from previous research on temporary

³ Data on the coronavirus is available on the website of Worldometer. Information was retrieved 30/06/2021 from <https://www.worldometers.info/coronavirus/?#countries>.

school closures, hours of teaching, class size, graduation standards and exams and the importance of the family environment in supporting children's learning. Previous studies from these fields of research can help us shed light on some of the potential dangers school closures presented to student learning during the pandemic. Section 7 concludes the paper.

2 Distance learning – expected effects on learning

In the Nordic countries, the relevant policy alternative during the pandemic was never a complete closure of schools without any teaching at all, but rather a transition to distance learning. Distance (or remote) learning is a form of education where students and teachers, instead of meeting in-person, hold classes and communicate through the internet, communication platforms, e-mail, etc. Distance learning can be both synchronous through real-time interaction and asynchronous through self-paced learning activities that take place independently of the teacher. In the first case, students and teachers are separated in space; students follow an online class in real-time and have the possibility to interact with the teacher and each other. In the latter case, students and teachers are separated both in space and time; for example, when students follow a pre-recorded lecture. Prior to the COVID-19 pandemic, teaching in-person was the norm at the compulsory and upper secondary level in all the Nordic countries, although distance learning was occasionally used under special circumstances.⁴

In theory, transitioning to distance learning could have both positive and negative effects on how much students learn.⁵ One advantage of distance learning often highlighted in the literature is the increased flexibility this form of teaching entails: students are able to access course material, including pre-recorded lectures, whenever it suits them, and they have greater possibilities to spend more time on content they find difficult and skip parts they have already mastered. Through distance learning, students can potentially also gain access to a larger supply of courses than is available locally. However, it is hard to believe that the latter has been the case during the switch to distance learning brought on by the COVID-19 pandemic. Moreover, distance learning is sometimes advocated from a cost-saving perspective (e.g., Deming et al. 2015), but in this article, we will disregard any effects on school budgets. It is not likely that the rapid transition to remote learning has resulted in cost-saving opportunities for schools. On the contrary, the opposite may be the case, given that several reports find that the teachers' and school principals' workloads have increased (see Section 4). Researchers have noted that it is hard to believe that schools have

⁴ For example, Sweden sometimes allowed for synchronous remote instruction if the student base was very small or when there was a severe lack of qualified teachers. In such cases, students participated in distance learning on school premises and a mentor was present (see, e.g., SOU 2017:44).

⁵ The following discussion is partly based on a review article by Escueta et al. (2020).

been able to take full advantage of the positive aspects of remote instruction during the pandemic. It has also been suggested that the type of instruction provided during the crisis has been more of a temporary solution. Thus, *emergency remote teaching* has been proposed as a more appropriate term to denote online teaching during a crisis like the COVID-19 pandemic (Bozkurt and Sharma 2020; Hodges et al. 2020).

One of the concerns raised is that distance learning tends to demand more of the students themselves in terms of planning and self-discipline. Students who struggle with these challenges run an increased risk of falling behind. Here, we can expect a strong age gradient, where remote learning can be expected to be more challenging the younger the students are, and increasingly dependent on parental assistance to work satisfactorily. Moreover, it is likely that distance learning removes opportunities for interaction that arise more naturally when students and teachers meet in-person, and makes it is harder for teachers to adjust the lessons to the students' specific needs. The social interactions that take place in a physical school setting are also important for the development of non-cognitive abilities, such as social skills, perseverance, teamwork, which are important for future labour market prospects (e.g., Heckman and Rubinstein 2001). To meet teachers and fellow students in-person can also create more social pressure to perform better and motivate students to be more committed to their studies (Loeb 2020).⁶

Note that the expected advantages and disadvantages can differ somewhat depending on whether distance learning is synchronous or asynchronous. For example, asynchronous teaching with self-paced learning activities is likely to provide greater flexibility, while opportunities for interaction are better with real-time instruction. In our review of the research presented in Section 5, we make no distinction between synchronous and asynchronous remote teaching. In the studies conducted before the pandemic that we refer to, there are elements of real-time interaction, but in most cases, distance learning has been asynchronous. We have no detailed information on the extent to which schools in the Nordic Region relied on synchronous vs asynchronous remote teaching during the pandemic. In practice, it has often been up to individual schools and/or teachers to decide on these matters. Thus, it is reasonable to believe that the use of synchronous vs asynchronous practices varies.

⁶ Effects of distance learning may differ for boys and girls. Research finds that competitiveness is more prevalent in boys (Gneezy and Rustichini 2004), which can affect the willingness to perform. It is also possible that home schooling could be beneficial for a small group of students who prefer a less competitive or social interactive environment.

3 School closures and distance learning in the Nordic countries during the pandemic

In this section, we describe the extent to which each of the Nordic countries has relied on distance learning for compulsory and upper secondary schooling⁷ during the first three semesters of the pandemic, more specifically from March 2020 until June 2021. Table 1 provides a summary of the various strategies adopted. But before going into the details for each country, it is helpful to state some common features as well as outline some broad differences between the policies adopted.

Overall, the initial strategies followed to fight the COVID-19 pandemic were based on the understanding that children and adolescents were not the driving force of the pandemic: they did not seem to spread the virus as easily and were not getting as sick as older individuals, although the risks were assumed to increase with age. There was also a widespread conviction that school closures would have severe negative impacts on children, such as loss of learning opportunities and worse mental health, as school attendance is also considered important for a child's social and emotional wellbeing and development.⁸ In all of the Nordic countries, however, children were obliged to stay home from school if they had COVID-19 symptoms, and COVID-tests have been required or recommended if symptoms were noted.⁹ Sometimes schools provided remote teaching to students also during such spells of absence. Common for all the Nordic countries, except Iceland, is also that many standardised national exams have been cancelled.

⁷ All five countries have nine or ten years of comprehensive compulsory schooling, after which students may continue to upper secondary school which consists of several different tracks (both general college preparatory and vocational). Upper secondary school is voluntary, but the vast majority chose to pursue this level of education in all of the Nordic countries.

⁸ See, e.g., Public Health Agency of Sweden (2020).

⁹ There are also reports, from at least Sweden and Norway, of parents choosing to keep their children home from school due to fear of infection (Swedish Schools Inspectorate 2020; Norwegian Directorate for Education 2021c).

Table 1 Summary of school closures and distance learning in the Nordic countries

	Sweden	Norway	Denmark	Finland	Iceland
Primary School					
Spring 2020 (From mid-March)	Open.	Closed for 6 weeks for grades 1-5. Closed for 9 weeks for grades 6-7. Thereafter open.	Closed for 4 weeks for grades 1-5. Closed for 8 weeks for grades 6-9. Thereafter open	Open for grades 1-3, but remote teaching was recommended. Closed for 8 weeks for grades 4-6, thereafter open.	Open, but with limited activities for 6 weeks.
Autumn 2020	Open.	Mostly open except for a couple of weeks around Christmas.	Open for grades 1-4. Closed for 2 weeks before Christmas for grades 5-9 in half of the municipalities. Otherwise partially open, with local exceptions.	Open, with local exceptions for grades 4-6.	Open, with local exceptions (in some cases also limited activities).
Spring 2021	Open.	Mostly open except for a couple of weeks around Easter.	Closed for 5 weeks for grades 1-4, thereafter open. Closed until 15 March for grades 5-9, thereafter partially open (50% for grade 9 and 1 day/week for grades 5-8) with local exceptions. From 6 April: 50% open for all. From 6 May: Fully open.	Open, with local exceptions for grades 4-6.	Open, except for 2-4 days before Easter.
Middle school					
Spring 2020 (From mid-March)	Open.	Closed for 9 weeks, thereafter partially open.	<i>See above</i>	Closed for 8 weeks, thereafter open.	Open, but with limited activities for 6 weeks.
Autumn 2020	Open.	Open or partially open, with local exceptions. Fully closed for 2 weeks.	<i>See above</i>	Open, with local exceptions.	Open.
Spring 2021	Open, with local exceptions.	Open or partially open, with local exceptions. Closed for 2 weeks around Easter.	<i>See above</i>	Partially open; fully closed for 3 weeks.	Open, except for 2-4 days before Easter.
Upper secondary school					
Spring 2020 (From mid-March)	Closed.	Closed for 9 weeks, thereafter partially open	Closed for 6-10 weeks.	Closed.	Closed for 6-8 weeks.
Autumn 2020	Partially open; fully closed for 2 weeks.	Open or partially open, with local exceptions. Closed for 2 weeks around Christmas.	Partially open, with local exceptions. Closed for 2 weeks before Christmas in half of the municipalities.	Open, with local exceptions.	Open, but with limitations and distance learning during peak of infections.
Spring 2021	Partially open.	Open or partially open, with local exceptions. Closed for 2 weeks around Easter.	Closed for 8 weeks. Thereafter gradually reopened, starting with students in the final year. From 21 May fully open.	Partially open; fully closed for 3 weeks.	Open, except for 2-4 days before Easter.

Note: In all Nordic countries except Denmark, schools are divided into three levels. 'Primary school' covers the first six or seven years of schooling. 'Middle school' covers the remaining two or three years necessary to complete compulsory education. 'Upper secondary school' refers to the last three years of schooling. In Denmark, schools are divided in two levels: 1-9 and 10-12. The following categories have been used in the table: (i) *Open*: If schools as a general rule have been open as usual (although some specific schools at times have been closed for a short period of time). (ii) *Open with local exceptions*: If schools are open as usual but closed in certain regions/municipalities/city districts if there is a high infection rate. (iii) *Partially open*: If, e.g., students only attended for a few hours a day or parts of the week. (iv) *Closed*: If teaching, as a general rule, is conducted remotely (even if there are some exceptions).

From March 2020, Denmark and Norway closed all schools and introduced distance learning for school children of all ages for a period of four to eight weeks.¹⁰ The school closures often lasted longer for the older students. Finland adopted a similar strategy during spring 2020, with the exception that children in grades 1–3 could attend school (although distance learning was strongly recommended also for this age group). During the same period, Iceland closed upper secondary schools and imposed certain limitations on compulsory schools, whereas Sweden only introduced distance learning in upper secondary school. During the remainder of the period covered in this article, all of the Nordic countries except for Denmark¹¹ kept compulsory schools open most of the time, but often with regional or local (temporary) exceptions in areas/schools with a high rate of COVID-19 infection. Overall, Sweden stands out as having kept its compulsory schools open to a greater extent than the other countries. This is not the case for upper secondary school, where Sweden and Finland had the longest periods of school closures during spring 2020. In spring 2021, Denmark instead stands out by imposing the most restrictive policies on attendance in upper secondary schools in the Nordic Region.

Digital technology is a prerequisite for distance learning to work satisfactorily. In this respect, it is important to note that the Nordic education systems had come a rather long way already before the pandemic began. The conditions for remote learning in all five countries are rated among the best in the world in terms of digital preparedness (European Commission 2019; OECD 2021a). Even in the most disadvantaged schools¹², over 90% of the students that took part in PISA 2018 reported that they had access to a computer linked to the internet at home which they could use for school work (OECD 2021a). It is common for upper secondary schools to provide students with their own computer. For instance, approximately nine out of ten upper secondary schools in Sweden provided students with their own laptop or tablet in 2018, according to the Swedish National Agency for Education (Swedish NAE 2019). In Norway, close to 100% of upper secondary school students had access to a computer provided by their school in 2019 (Fjørtoft, Thun, and Buvik 2019). One-to-one computer programmes are also increasingly common among younger students, although computer access tends to increase with student age (Hall et al. 2021). For example, in Norway, 83% of students in grade 9 had access to a personal school computer in 2019, while the corresponding numbers for grades 7 and 4 were 56 and 32%, respectively (Fjørtoft, Thun, and Buvik 2019).

¹⁰ The decision to close schools for the youngest students was not unanimous. For instance, in Norway an important argument for the closure of schools was to minimise mobility. From the outset, the Norwegian Health Institute did not support the initiative. The Holden Commission (Norwegian Directorate of Health 2020) concluded in April that closing schools and kindergartens was the measure that incurred the highest socio-economic cost and the Corona commission (NOU 2021) arrived at the same conclusion.

¹¹ Denmark had a longer period of school closures also during the spring of 2021; see Table 1.

¹² Defined as a school whose socio-economic profile is at the bottom quarter among all schools in the relevant country.

Access to computers is, of course, not enough for distance learning to work well. Teachers may, for example, lack the skills needed to be effective using this mode of instruction. In a survey conducted among lower-secondary teachers in 2018, 19–22% in Finland, Sweden, Norway, and Iceland reported a high level of need for professional development in ICT skills for teaching (OECD 2020c; 2020d; 2020e; 2020b). These figures are close to the OECD average of 18%. Digital competence among teachers was somewhat higher in Denmark, where only 11% reported the same level of need (OECD 2020a).

When distance learning has been used in the Nordic countries during the COVID-19 pandemic, children with limited access to a computer or the internet have usually been offered instruction in the school facilities. This has sometimes also been the case for children from a disadvantaged home environment and children with special needs, as well as those with parents in essential professions like nurses and doctors. For example, 34,000 pupils in compulsory school in Norway had in-person instruction during periods when the schools were closed in 2020 (Norwegian Directorate for Education 2020b).

3.1 Sweden

In Sweden, all teaching in upper secondary schools was to be carried out remotely from 18 March 2020. In practice, this meant that most teaching during the last three months of the spring semester was online, although sometimes in combination with classes held on the school premises (Swedish NAE 2020b). Compulsory schools (grades 1–9), on the other hand, were not affected – they remained open as usual. In May 2020, the Swedish Teachers' Union conducted a survey among their members. They found that around 75% of the upper secondary school teachers who responded to the survey had switched *entirely* to remote teaching.¹³ Even though compulsory schools continued to be open throughout the spring, distance learning was sometimes used here as well, for example, for students who were absent.¹⁴

From March 2020 to June 2021, several decisions were made regarding possibilities of providing in-person vs remote instruction. In compulsory schools, teaching was mainly conducted on site throughout the entire period, but the government increased the possibilities for local school organisers to decide when to use distance learning. In particular, the opportunities to use remote instruction were increased for lower secondary schools (grades 7–9) in the spring semester of 2021. A survey by the Swedish Teachers' Union (2021) in February 2021 showed that approximately half of their members working in lower secondary schools used some degree of

¹³ This proportion increases to approximately 90%, if we include teachers answering that *more than half* of their teaching is conducted remotely.

¹⁴ In grades 7–9, four out of ten teachers had provided remote instruction for students. In grades 4–6, the corresponding number was three out of ten, and in grades 1–3, two out of ten (Swedish Teachers' Union 2020).

remote instruction. However, distance learning became less frequently used as the semester progressed (Swedish NAE 2021a; 2021c; 2021b). Younger children (grades 1–6) were almost exclusively taught on-site.¹⁵

In upper secondary schools, the situation was somewhat different. After conducting remote instruction throughout the spring semester 2020, it was decided that teaching at this level would be on-site again in the autumn, although the option of partially using remote instruction remained open. The government also emphasised that teaching should be carried out so that the guidelines that applied to society as a whole could be followed.¹⁶ This meant that distance learning continued to be a common feature also during the autumn semester. On 3 December 2020, it was again decided that all teaching in upper secondary schools would be carried out remotely for the remaining two weeks of the semester. In January 2021, upper secondary schools gradually began to transition back to teaching in-person. However, as the COVID-19 situation was still considered severe, caution was urged, and decisions about when and how to use remote instruction were to be made locally by school organisers depending on their local situation. Thus, distance learning remained an element of education in many upper secondary schools¹⁷, although the amount of classroom teaching increased during the spring (Swedish NAE 2021c; 2021b).

3.2 Norway

All kindergartens and schools in Norway were closed from 13 March to 26 April 2020. Thereafter, schools gradually reopened, beginning with the youngest students. By 11 May 2020, all schools were fully reopened. Remote instruction was used during the school closures.

Since the start of the school year 2020/21, schools have, for the most part, remained open. Except for during some higher peaks of infection rates when all schools were closed – at the start of the pandemic, around Christmas 2020, and Easter 2021 – it has been up to the municipality/institution to decide on educational measures (NOU 2021:6). When schools were notified of a COVID-19 outbreak, all individuals who potentially could have had contact with the infected had to isolate for ten days. This meant that several classes and grades, and sometimes the entire school, switched to distance learning from one day to the next. The overall policy has been to give priority to classroom teaching for the youngest pupils. To ensure that remote teaching was not used more than necessary, a directive was introduced on 25 January 2021, under which decisions about distance learning had to be reported to a higher public authority.

¹⁵ Note that remote learning was used to a small extent also in grades 1–6. According to the Swedish Teachers' Union (2021), approximately 1–10% of their members in grades 1–6 conducted *some* teaching remotely in February 2021.

¹⁶ For example, the general recommendations on social distancing and restrictions on the number of people that were allowed to gather in one place.

¹⁷ According to a survey of principals of upper secondary schools conducted in April 2021, 60% of the principals participating in the study reported that in-person and remote instruction was combined. When remote learning was used, it was almost always conducted as synchronous instruction (Swedish Schools Inspectorate 2021).

Oslo is a special case, as it has had considerably higher levels of infection and transmission than the rest of the country. In an attempt to flatten the curve, the city mayor implemented considerably more restrictive policies than elsewhere. Primary school children have received some remote instruction, but teaching has taken place mostly at school. Around half of Oslo's primary school students received either a combination of remote and in-person schooling or just schooling at home (NOU 2021:6). Lower secondary schools have generally mixed remote and in-person teaching, and upper secondary schools have mostly relied on remote teaching. Since Christmas 2020, and due to the spread of more contagious COVID-19 variants, policies became even more restrictive. Oslo reopened in the last week of May 2021.

3.3 Denmark¹⁸

On 16 March 2020, all schools and other educational institutions in Denmark closed and moved to remote teaching. A month later, a gradual reopening began, starting with schools for the youngest children. Preschools, early childhood care centres, and primary grades 0–5 reopened on 15 April (the first country in Europe to start reopening). Both lower and upper secondary schools were allowed to reopen for senior year students after six weeks; special needs schools were also allowed to reopen on this date. Grades 6–10 stayed closed for eight weeks and reopened on 18 May. During lockdown, schools had an obligation to provide extra support to students with special educational needs. Additional support was also provided to vulnerable student groups to prevent drop-out rates from rising.

Schools remained partly open for the autumn semester of 2020. The usual pattern was to divide classes into two or three smaller groups and, whenever possible, teaching took place outdoors. Attendance was staggered to avoid crowding, students were required to observe social distancing regulations, and desks were placed two metres apart. It was also common for students to have shorter school days and/or to not have daily attendance. Any child or teacher displaying even minor COVID-19 symptoms was not allowed to attend school. Students in isolation at home were entitled to receive remote instruction, and it was up to their parents to decide when they could return to school.

As of 9 November 2020 and through April 2021, more restrictive policies were again introduced. During this period, restrictions and the degree of lockdown imposed on schools varied by regional level of contagion with the most strongly affected municipalities giving priority for classroom teaching for the youngest students (grades 1–4) and those in the final years of lower secondary school. For instance, on 9 December, all schools in 38 municipalities closed and switched to remote teaching for all students (except grades 1–4 and vulnerable students). From

¹⁸ Information about school closures in Denmark can be found in, for example, EVA (2021a; 2021b).

Christmas until 8 February, Danish schools again went into a total lockdown with remote teaching. Schools gradually reopened during the spring semester; they were closed for five weeks for grades 1–4, while most students in grades 5–8 had limited in-person teaching for approximately three months. From 6 May 2021 onwards, all 0–10 grade classes were allowed to return to school every day. As for upper secondary school, final year students returned part-time after eight weeks, and the rest after about three months. From 21 May, all students were allowed full access to their schools until the end of the semester.

3.4 Finland¹⁹

From 18 March until 14 May 2020, Finland closed its school system and transitioned to remote instruction (i.e., for a total of eight weeks). Students with special needs and children in grades 1–3 were still allowed to attend school in-person. However, remote instruction was recommended for students in grades 1–3 where possible. Compulsory schools (grades 1–9) returned to the classrooms in mid-May, whereas teaching in upper secondary schools continued to be conducted remotely throughout the spring semester.

When the new school year started in mid-August, the general recommendation was that teaching should take place in classrooms, but schools were advised to switch to remote instruction if COVID-19 made it impossible to deliver teaching on site in a safe way. Finland relied on their decentralized institutional setting, and local school authorities were given a mandate to decide whether to provide in-person or remote instruction based on the number of verified COVID-19 cases in their area. This meant that the use of distance learning varied geographically. However, remote instruction was not possible for students with special needs or for children in grades 1–3.

In March 2021, the spread of COVID-19 was deemed problematic, and distance learning was introduced for all students in grade 7 and upwards for three weeks starting on March 8. Younger students continued to be taught in classrooms. In April 2021, all schools were reopened, including upper secondary school.

3.5 Iceland²⁰

As in the other Nordic countries, Iceland's upper secondary schools switched to remote instruction in mid-March 2020. In compulsory school, activities were limited. For example, a ban on gatherings of more than 20 people guided decisions on how to organise teaching. In practice, this implied different things in different schools: school days were shortened, subjects like sports,

¹⁹ This section is based on information from the following sources: Ahtiainen (2021); Lavonen and Salmela-Aro (2022); Finnish NAE 2020; 2021a; 2021b).

²⁰ This section is based on e-mail correspondence with officials at the Directorate of Education in Iceland during November 2021 and on information retrieved from www.covid.is/english (March 30, 2022). A timeline describing the development during covid-19 in Iceland is available on <https://www.covid.is/sub-categories/iceland-s-response> (information retrieved March 30, 2022).

arts and crafts were postponed, canteens were closed, some schools stopped providing school transport, and schools where COVID-19 spread among the staff were closed.²¹ Remote instruction was common for the higher grades. As of 4 May 2020, upper secondary schools reopened with certain limitations, whereas compulsory schools essentially returned to normal.

During the autumn semester of 2020, schools were, in principle, open in Iceland. However, restrictions, such as mask wearing, social distancing and upper limits on the number of people who could gather also applied in the education system. The precise restrictions were altered and adjusted a couple of times during the autumn, and restrictions were stricter in upper secondary schools than in compulsory schools. Remote teaching was still used to some extent during this semester, especially for older students.

On 1 January 2021, new rules on school restrictions were introduced: upper secondary schools were able to start the semester on-site to a large extent, and more relaxed regulations applied to compulsory schools. In mid-March 2021, the infection rate began to increase, especially amongst children. As a result, Iceland decided to start the Easter holiday break a couple of days earlier than normal. Schools reopened again on 31 March.

4 Student and teacher experiences during the pandemic

How COVID-19 has impacted the school systems in the Nordic countries has been the subject of several reports since the start of the pandemic. A common problem with many of these studies is that it is difficult to know to what extent the findings can be generalised; conclusions are sometimes based on qualitative data or non-representative samples. In addition, the time for planning, data collection and analysis has sometimes been limited. Nevertheless, similar findings can be observed in many of the studies, and we believe that these offer valuable insights, although some caution should be applied.

Some reports note that distance learning has worked surprisingly well given the circumstances (e.g., Finnish NAE 2020; Swedish NAE 2020e; 2020c; Swedish Schools Inspectorate 2020). The Norwegian Directorate for Education's survey of school principals, school organisers and teachers shows that the digital infrastructure can hardly be regarded as an obstacle to implement remote instruction (Federici and Vika 2020). Almost nine out of ten schools report that they have the necessary digital infrastructure, such as computers, networks, programs and learning

²¹ A survey by Statistics Iceland shows that 80% of the students in compulsory schools did not miss any teaching day or only missed 1–2 days during the 2019–2020 school year due to school closures. However, on average there were 14 days with reduced attendance. Remote learning was more common among older children: in the first grade the average number of days of remote learning was 2.3 and in grade 10 it was 9.9 days (see <https://www.statice.is/publications/news-archive/education/covid-19-and-school-days-in-compulsory-schools-2019-2020/>).

resources, to be able to provide students with education at home. This applies to both primary and secondary schools in Norway (Norwegian Directorate for Education 2021c).²² A vast majority of teachers also report that they have improved their digital competencies during the pandemic (Federici and Vika 2020). Lavonen and Salmela-Aro (2022), discussing the experiences in Finland, also conclude that teachers' digital competencies improved during the pandemic and that the shift to remote teaching was rather smooth.

Although the teaching may have worked better than many feared, most teachers and students believe that learning deteriorated when students and teachers did not meet in-person (Gudmundsdottir and Hathaway 2020; Fjørtoft 2020; Norwegian Directorate for Education 2020; Swedish Teachers' Union 2020; Swedish Schools Inspectorate 2021; Swedish NAE 2021e; Ahtiainen 2021; Finnish NAE 2020; 2021a; 2021b; Lavonen and Salmela-Aro 2022). For example, reports from Sweden conclude that many teachers find it more difficult to help students reach the educational objectives when classes are held online (Swedish Teachers' Union 2020; Swedish NAE 2021e) and the majority of students find that teaching in-person is more rewarding than remote instruction. Norwegian survey studies among students and teachers in upper secondary schools conclude that learning was significantly reduced during the school closure in the spring of 2020 (Andersen et al. 2021). A survey from Denmark reaches the same conclusions – students in upper secondary school experienced that they learned less when schools were closed (Wester 2021). A common view is that it is difficult to have discussions on digital platforms; students are generally less involved. This also means that it becomes harder for teachers to notice when students need additional help (e.g., Fjørtoft 2020; Swedish Schools Inspectorate 2021). Survey studies from other European countries show that many students only had sporadic contact with their teachers during school closures and that students spent less time on school work (e.g. Grätz and Lipps 2021; Grewenig et al. 2021; Andrew et al. 2020). Blikstad-Balas et al. (2022) report the same patterns among Norwegian students, especially among the lowest grades. For instance, more than half of the parents of students in grades 1–4 respond that their child had contact with their teacher 2–3 times a week *at most* and that the child spent less time on schoolwork than on a normal school day.

Several studies from Norway indicate that many teachers found both motivating students and creating an engaging online classroom environment challenging (Gudmundsdottir and Hathaway 2020; Fjørtoft 2020; Federici and Vika 2020; Norwegian Directorate for Education 2020b). Decreasing student motivation during the pandemic is also found in studies from the other Nordic countries (e.g., Ahtiainen 2021; Swedish Schools Inspectorate 2020; Finnish NAE 2020; 2021a; 2021b). Another finding from a large-sample study of Icelandic students, aged 13–18, is that

²² The largest technical challenge for distance learning seems to be poor internet access (e.g., Andersen et al., 2021).

depressive symptoms increased, and mental wellbeing decreased during the pandemic, beyond expectations based on previous trends. This pattern is especially strong among girls and among 16–18-year-olds (Thorisdottir et al. 2021).²³ A Norwegian study, based on population-wide data on health care consultations related to mental health symptoms and disorders among 6–19-year-olds, also find evidence of deteriorating mental health, which became apparent during the autumn of 2020 and onwards (Evensen et al. 2021).²⁴ However, it is not clear to what extent these patterns are caused by school closures or by other circumstances during the pandemic. Svaleryd and Vlachos (2021) try to separate the effect of school closures from the effects of other pandemic-related factors, by comparing how mental health indicators developed over time for Swedish students in upper secondary school (which was partly closed) with the development for students in lower secondary school (which remained open). Using data on health care contacts and prescriptions of medication for psychiatric conditions, they find that mental health among upper secondary school students, in fact, seemed to improve during the period schools were partly closed. Hence, the findings in Svaleryd and Vlachos (2021) suggest that deteriorating mental health may not have been caused by school closures alone, but also by other policies that reduced social contact during the pandemic.

Certain groups of students are likely to have been more adversely impacted by distance learning than others. A general observation is that remote learning seems to have worked better for older students than for younger (e.g., Swedish NAE 2020e; 2021e; Swedish Schools Inspectorate 2021; Blikstad-Balas et al., 2022). Moreover, vulnerable groups are often disadvantaged by remote learning. For example, children with poor Swedish language skills – especially those who have recently immigrated²⁵ – and students with a poor study environment at home are considered to have been negatively affected by distance learning according to studies by the Swedish NAE (2020d; 2020b) and the Swedish Schools Inspectorate (2020). Studies from Norway indicate that students’ academic progression during remote instruction was greater the more the parents got involved, and the higher the socioeconomic background of the parents (e.g., Bakken et al. 2020; Fjørtoft 2020). Federici and Vika (2020), also studying the Norwegian context, show that a majority of schools had guidelines and had reallocated resources for identifying vulnerable students when schools were closed. Nonetheless, teachers in both primary and secondary schools reported that assisting vulnerable students remained a challenge.

²³ However, the study finds that substance use decreased

²⁴ There are also some Norwegian studies, based on much smaller samples (2500–3500 students), that do not find any increase in depressive symptoms, based on self-reported data; see Hafstad et al. (2021) and Burdzovic Andreas and Brunborg (2021).

²⁵ A lack of digital skills and restricted access to computers and the internet among new immigrants are some of the problems highlighted. Schools were, in many cases, able to lend students computers and tablets. However, some schools also reported a lack of available technical equipment (Swedish NAE 2020d).

It has also been observed that the workload and stress placed on teachers (and school principals) has been greater than normal (Federici and Vika 2020; Fjørtoft 2020; Swedish Schools Inspectorate 2021; Lavonen and Salmela-Aro 2022). Hence, teaching was considered more challenging than usual. Some subjects seem to have been more difficult than others to teach online. In particular, practical elements and workplace-based learning have been challenging to carry out (e.g., Swedish NAE 2020e; 2020c).²⁶ Students following a vocational track in upper secondary school have, for instance, faced challenges finding work practice (e.g., Andersen et al. 2021).²⁷

The transition to distance learning has also made assessment and grading more difficult (e.g., Swedish NAE 2020b). Many oral and written exams, such as standardised national exams, were cancelled and replaced by teachers' assessments. Both Norway and Sweden have seen a significant rise in marks among final year students in both upper and lower secondary school in 2020, relative to previous years (Swedish NAE 2020f; 2020a; Norwegian Directorate for Education 2021b). Similarly, the proportion of students graduating from upper secondary school within the expected time increased in Sweden (Swedish NAE 2021d), and in Norway, the share dropping out decreased both in 2020 and in 2021 (Norwegian Directorate for Education 2021a).²⁸ That study results seem to have improved, despite the many challenges faced by both teachers and students during the pandemic, suggests that teachers applied more lenient grading standards in the absence of objective exams (Swedish NAE 2021d; Svaleryd and Vlachos 2021). Because grades are key to students' access to higher education, the move to teachers' subjective assessments may have unforeseen long-term consequences for the equality of opportunity.

In summary, although teachers have been able to continue teaching, and that technical equipment generally seems to have been available, teachers, parents, and students generally agree that the quality of education declined when schools shifted to remote teaching during the pandemic. Studies also agree on that all students are not equally affected: younger students, students with special needs and students with poor skills in the majority language are pointed out as particularly vulnerable groups. Student in vocational tracks in upper secondary school constitute another group of potential concern, as the pandemic has limited their opportunities to take part in workplace-based learning. Overall, the experiences seem very similar in the five

²⁶ According to a study by the Swedish School Inspectorate (2021), mathematics is ill-suited for remote learning, since it is a subject that requires close individual follow-up from the teacher. See also Lavonen and Salmela-Aro (2022) for a similar conclusion based on experiences from Finland.

²⁷ An extra challenge to upper secondary school students in vocational tracks identified in Norway, is layoffs among apprentices. In the spring of 2020 one in ten apprentices was laid off (Norwegian Directorate for Education 2020a). In November 2020, 0.7% of all apprentices were laid off. Within Hospitality and Food, the proportion of laid-off workers was much higher, at 12% (Bjørnset 2021). This can negatively affect the apprentices' ability to complete their training.

²⁸ It has been hypothesised that home schooling and cancelled exams may have played a role in the fall of the dropout rate. As the same time, since absenteeism was not registered in Norway from mid-March until the end of the school year, it is also possible that not everyone who abandoned their studies was recorded.

Nordic countries. It should be emphasised, however, that it is uncertain how stated experiences of teachers and students correspond with actual learning.

5 Research on the short-term effects of distance learning

The causal impact of remote vs in-person instruction has been the subject of many studies. In this section, we discuss the expected impact of remote instruction on student learning by reviewing previous high-quality research.²⁹

5.1 Studies of distance learning in higher education

Research on distance learning conducted before the pandemic has focused primarily on tertiary education, where remote instruction has a long history, building on the tradition of correspondence studies (Escueta et al. 2020). Although the focus of this article is on younger students, clear lessons can be drawn from a number of convincing studies based on university students, several of which rely on evidence from randomised controlled trials (RCTs).

What does prior empirical research then tell us regarding the impact of taking university (or college) courses online, compared to in-person in a classroom or lecture hall? Comparing the academic performance of students choosing distance learning with those taught in classrooms is likely to provide a misleading answer to this question as the characteristics and circumstances of the two groups may also differ in various ways. For instance, distance learning has generally been more common among university students who work at the same time (Deming et al. 2015; Statistics Sweden 2012). Observing a potentially poorer academic performance by students on distance learning courses could thus be explained by less time devoted to studying, rather than distance learning in itself being less effective than in-person instruction.

Figlio, Rush, and Yin (2013) circumvent this methodological problem by conducting a randomised experiment. Students taking an introductory course in economics at a large prestigious university in the US were randomly assigned to either attend the lectures in-person or watch recorded lectures online. All other factors – content, examinations, and lecturers – were the same for both groups. The results show that the students who attended the lectures in-person on average performed slightly better than those who participated online. For certain groups of students, there was a larger difference in performance: minority students, male students, and students whose prior college GPA was below the median benefited more from being taught in-person.³⁰

²⁹ The discussion in this section builds to a considerable extent on a discussion presented in Hall and Lundin (2021).

³⁰ On average, the students who participated remotely scored 2 points less than those who were taught in-person, on a test where the maximum score was 100. Male students scored on average 3.5 points less, those with a GPA below the

In another compelling study, Bettinger et al. (2017) examine the same question but use data from a broad range of undergraduate courses at a less prestigious American university, where admissions criteria are lower.³¹ They find clear negative effects of distance learning for several outcomes: Students participating remotely receive lower grades both in the course taken online and in other future courses, particularly when the subsequent course is based on the previous online course. Students who participated remotely also had a higher probability of dropping out. The estimated effects are judged to be large.³² In line with the results in Figlio, Rush, and Yin (2013), the lower ability students (previous low grades) are the most adversely affected. Noteworthy, for students with a prior GPA in the top three deciles, they find no negative impact of remote learning.

The results from these two studies are in line with the conclusions drawn in a recent review article by Escueta et al. (2020). The authors review several studies based on either RCTs or regression discontinuity designs, where the aim has been to examine the effects of distance learning compared to being taught face-to-face. Most of the studies are conducted at American universities. The authors conclude that distance learning generally seems to lead to poorer results, although the average difference is often quite small. However, there does not seem to be the same negative pattern for courses where teaching in-person is combined with elements that are carried out online.

The overall message from studies of university students, conducted before the pandemic, is thus that remote teaching tends to have a negative impact on learning, although effect sizes vary depending on context and student population. Another clear message is that the negative impacts are largest among the weakest student groups; the academically strongest students are not necessarily negatively affected.³³

The COVID-19 pandemic has provided a unique context in the sense that remote instruction has been required also for courses not designed to be given online and taught by teachers not necessarily accustomed to this mode of teaching. The rapid transition also gave limited time for preparation and adjustment of teaching styles and pedagogy to the online format. Given this, one could suspect that the negative impacts would be larger during the pandemic than under normal

median scored 4 points less, and those who belonged to a minority (*Hispanic*) as much as 11 points less when being taught online. All of the differences were statistically significant.

³¹ In terms of method the authors use an instrumental variables approach, exploiting the fact that the possibility of taking a certain course face-to-face varies between semesters, and also depends on the students' travel time to the campus where the course is held.

³² Participating remotely led to student grades in that course falling by about a third of a standard deviation. Effects exceeding 0.2 standard deviations are usually considered large in the literature on effects of educational interventions; see Kraft (2020).

³³ See Cacault et al. (2021) for an RCT that specifically examines heterogeneity by student ability. They find that the possibility of attending online lectures lowers achievement among low-ability students and increases achievement among high-ability ones. However, in the setting examined, online lectures were offered as a complement; all students had the possibility of also attending the lectures in-person, and online access only decreased attendance by 8%.

circumstances. A new (not yet published) study by Kofoed et al. (2021) conducted at a US Military Academy during the pandemic autumn of 2020 sheds some light on this. The study is based on an RCT, where students in economics are randomised to either attend lectures in-person or online. The results show that online participation lowered a student's final grade by 0.215 standard deviations, which can be considered a large effect (cf. Kraft 2020).³⁴ In line with previous studies, the negative impact is largest for students with lower academic ability. Answers from a post-course survey show no difference in study time between online and in-person students. However, online students disclosed that they found it harder to concentrate and felt less connected to their teachers and peers than students that were taught in-person. Although more research is clearly needed, this study gives some support to the idea that the negative impacts found before the pandemic may constitute a lower bound on the learning gap induced by policy responses to the pandemic in the higher education sector.

The mechanisms present at the tertiary level can also be expected among secondary and primary school students, and it is likely that the pattern of negative impacts will be even more pronounced in those age groups, as university students are both older and have been selected on the basis of prior educational achievements. The younger the students, the less capable they are of doing independent work, and the more they are reliant on the support of parents and teachers.³⁵

5.2 Studies of distance learning in primary and secondary education

There are considerably fewer studies of how remote instruction affects learning among primary and secondary school students. Moreover, the studies that are available tend to be methodologically less convincing; few studies have used experimental or quasi-experimental methods (Escueta et al. 2020). There is thus greater uncertainty as to whether the patterns found are really caused by distance learning or if they could be driven by other differences between the groups of students compared, or educational content, that was not possible to account for in the analyses.

An important exception is a randomised experiment conducted among US high school students by Heppen et al. (2017). The authors examine how students' knowledge of algebra is affected by taking a course online rather than being taught in-person. The course examined provided an opportunity for first-year students who had failed algebra to recover their credits. Around 1,200 students from 17 different schools were randomly assigned to either take the course online or in-person. The online students followed the course from a classroom where a mentor was present.

³⁴ Although not as large the effect found by Bettinger et al. (2017) for a less selective university.

³⁵ Xu and Jaggars (2014) find that there seems to be an age gradient in learning impact of remote instruction even among college students: online learning appears to be less effective the younger the students are. In line with the studies mentioned above, they also find that minority students, students with lower GPA, and males seem to perform worse when being taught remotely.

The online version of the course not only contained recorded lessons but also elements of formative assessment and interactive games. The students who participated online reported that they perceived the course to be significantly more difficult. They were also less likely to pass the course and scored lower on an algebra posttest.³⁶ One possible explanation discussed by the authors is that the online format did not allow the teachers the same opportunities to identify gaps in the students' knowledge and adapt the lessons accordingly. However, on examining the students' performance on subsequent maths courses one year later, the authors find no statistically significant differences between the two groups of students.

Another study worth mentioning is Fitzpatrick et al. (2020). This study examines how switching from a traditional public school to two types of US charter schools, virtual charter schools vis-à-vis charter schools with traditional classroom teaching, affects student performance.³⁷ The students examined attended grades 5–8. The authors find that switching from a traditional school to a school where all teaching takes place online, is associated with large negative effects on performance in both mathematics and English. However, the study also finds clear differences between the different types of schools when it comes to, for example, teacher quality, which seem to account for at least a part of the differences in outcomes.

The sudden and sometimes complete transition to distance learning during the COVID-19 pandemic has implied many additional challenges for schools and teachers that did not exist in the contexts studied above: remote teaching has, for instance, sometimes been required in subjects that seem particularly ill-suited for this mode of teaching (such as physical education, art, and music) and sometimes involved students who are likely to be too young to be able to handle the additional responsibility typically required for this form of learning. Researchers around the world are working to understand and gauge the pandemic's human capital impact on children and youth, and studies based on more objective measures of learning are now beginning to emerge.³⁸ However, most studies released so far originate from countries where the transition to distance learning appears to have presented much greater challenges than has been the case in the Nordic countries, in terms of access to technology and opportunities to rapidly transition to online teaching (see, e.g. Maldonado and De Witte 2021; Kuhfeld et al. 2020). It is not fully clear to

³⁶ Students who participated digitally were 12 percentage points less likely to recover their credits compared to those who were taught face-to-face.

³⁷ The study uses a matching approach to identify causal effects. Students who switched schools are compared to non-switchers with similar background variables and school results, from the same school, grade, and year.

³⁸ The first round of COVID-19 studies in the field of education have been based on surveys, where the purpose has been to assess how school lockdowns have impacted students' study time and learning environment. We discussed this type of studies in Section 4. Although they provide a valuable description of the challenges school lockdowns have entailed for students and parents, they do not provide a good basis for quantitatively assessing the learning impact of school closures.

what extent these studies capture impacts of remote teaching as opposed to impacts of no teaching (see Section 6).

A study by Engzell, Frey, and Verhagen (2021) from the Netherlands is an important exception. As in the Nordic countries, access to digital technology and broadband in the Netherlands seems to have been widespread, which should facilitate a transition to distance learning. The authors use the fact that national exams took place both before and after the 8-week school closure during the initial phase of the pandemic to estimate the impact on 8–11-year-old students' progress in maths, spelling, and reading.³⁹ They estimate an average learning loss which corresponds to around one-fifth of what students normally learn in a year. Since the school closure lasted about one-fifth of the school year, the authors conclude that students made little or no progress at all during the time schools remained closed.⁴⁰ The results also show that the learning loss was largest among students with less educated parents. In a recent working paper, Haelermans et al. (2021) examine the progress made by Dutch primary school students one year into the pandemic after they had been exposed to two periods of school closures (in total 15.5 weeks). Their results show that students had made less progress in reading, maths, and spelling compared to a similar period in the years before the pandemic. The size of the effect corresponds to 6 weeks less progress for spelling, 12 weeks for maths, and 17 weeks for reading. While the average impact per week of school closure is somewhat lower than in Engzell, Frey, and Verhagen (2021), the results confirm a substantial learning loss. The losses were again largest for socioeconomically disadvantaged students.⁴¹

A recent study from Norway by Skar, Graham, and Huebner (2021) also points to a considerable drop in learning during school closures, at least in the short term. The authors compare writing tests among grade 1 students taken one month after schools reopened in the spring of 2020 (after seven weeks of remote teaching) to an equivalent test among grade 1 students the previous year. The learning loss is significant both in terms of writing quality and fluency. A comparison with performance differences between grade 1 and 2 students before the pandemic suggests that grade 1 students affected by school closures would need to increase writing quality and fluency gains by 175 and 130%, respectively, during the following year in order to perform at the same level as grade 2 students did before the pandemic.

³⁹ The authors use a difference-in-differences design, comparing test results before and after lockdown to changes in test results during the same time period in previous years.

⁴⁰ They do not find evidence of important differences in effects between the different subjects studied.

⁴¹ Two other studies from the Netherlands, which are based on data from digital learning tools, arrive at a more optimistic view regarding student learning during school closures, at least for the students that use these tools and for the specific aspects of language and maths skills practiced; see Meeter (2021) and van der Velde et al. (2021). However, since it is likely that these digital learning tools replaced other forms of teaching during lockdowns, these results do not allow for an assessment of how students' overall performance in maths and language developed.

However, a new (so far unpublished) Danish study partly contradicts the concerning results of the above-mentioned studies, at least for the youngest cohorts of Danish children. Birkelund and Karlson (2021) study the development of student results on a national reading test 14 months into the pandemic, when the students had been exposed to between 8 and 22 weeks of school closures, using a similar method as Haelermans et al. (2021). For students in grade 8, who had been exposed to the longest periods of school closures, they find evidence of a decrease in reading performance, corresponding to around seven weeks of lost learning. However, among students in grades 2 and 4, they observe a learning gain. They also find little evidence of widening learning gaps by socioeconomic background. While the authors cannot pinpoint the factors responsible for the lack of learning loss in reading among the youngest students, they suggest that the explanation may lie in the national responses seen in Denmark to mitigate a large learning loss (e.g., additional teacher resources), but also that the teachers may have favoured reading above other subjects when children eventually returned to school. Two recent Swedish reports also fail to find evidence of any decline in student performance: Fälth, Hallin, and Nordström (2021) find no effect of the pandemic on reading skills among Swedish children in grades 1–3 and Svaleryd and Vlachos (2021) find no indication of any decline in maths performance among grade 9 students, based on a diagnostic test taken when starting upper secondary school.⁴² However, given that compulsory schools generally remained open in Sweden, the absence of effects is less surprising.

In summary, the few convincing studies of distance learning in primary and secondary schools conducted before the pandemic, align with the results found among university students: remote learning seems to have a negative effect on performance, at least for students who are academically weaker. The recent research results from school closures during the pandemic in Norway and the Netherlands confirm fears that distance learning may be particularly harmful to younger students. Learning losses among young students are more generally of particular concern: since learning is a dynamic process in which further learning builds on prior learning, future learning growth may also be affected (e.g., Cunha and Heckman 2007). However, the recent (not yet published) results from Denmark suggest that learning impacts may differ across contexts within the Nordic countries and that large learning losses could be counteracted by mitigating policies.

⁴² Svaleryd and Vlachos (2021) also show results from standardised tests in a few specific high school courses, given in the autumn of 2020, which were not cancelled. The results do not indicate that students' performance declined in relation to previous years. However, as only a minority of upper secondary school students took these tests and these students were primarily from the academic tracks, it is not possible to conclude how upper secondary school students were affected on average.

6 Research on other aspects relevant for the effectiveness of distance learning during the pandemic

Worldwide school closures may be more appropriately described as absence of schooling rather than remote schooling. According to UNICEF (2020), two-thirds of the world's school-age children have no internet access at home, which provides an indication of the educational gap the pandemic will cause worldwide. Even in areas/households in wealthy countries like the UK and the US, lack of access to the internet and devices has been a problem (see, e.g., Stelitano et al. 2020). As we have described earlier, this appears to have been less of an obstacle in the Nordic countries. Still, ample evidence indicates that the amount of time parents devote to educational activities and the quality of the instructional support they provide differs by family background, undermining the compensatory ambition the Nordic school systems have in reducing inequalities.

The impact of distance learning may be investigated along different dimensions. One is the direct effect of remote vs in-person teaching, covered above. This is the most relevant dimension for upper secondary schools, which were closed longest. However, for younger children, instruction has consisted of a combination of home schooling and classroom teaching during periods of the pandemic. This has been the case in all of the Nordic countries except Sweden, where schools never closed. Social distancing also changed how teaching was organised, the number of hours of instruction, the form of assessments, and perhaps also what children were expected to learn. For instance, in both Norway and Denmark, classes were sometimes divided into smaller groups. An implication of this is that the number of students per class was reduced and that teachers were able to pay more attention to each individual student. This could potentially mitigate the negative learning impacts we could expect from (partly) switching to remote teaching. In the following section, we summarise the lessons that can be learned from previous research related to temporary school closures, hours of teaching, class size, graduation standards, as well as the importance of the family environment for supporting children's learning.

6.1 Impact of temporary school closures and fewer teaching hours

There is a large literature that in different ways tries to measure how much students learn in school during a given period of time. Such measurements can be used to assess the extent of learning loss we can expect from a certain amount of missed teaching. Hence, we can get an idea of how large the loss of knowledge due to school closures could be, in cases where the reduction in classroom time is not adequately compensated by (equally effective) remote instruction and/or home schooling involving the support of parents. This could be regarded as an upper limit on the potential loss of knowledge.

The strategies used to assess how much students learn in school include, for instance, comparing students who, owing to their birth date (early or later in the year), started school at different ages (e.g. Cliffordson 2010; Webbink and Gerritsen 2013; Luyten, Merrell, and Tymms 2017) and assessing learning losses resulting from temporary school closures due to teacher strikes (e.g. Baker 2013; Jaume and Willén 2019), bad weather (e.g. Marcotte 2007), or summer holidays. Carlsson et al. (2015) is an example of the latter. They consider a situation in which young men in Sweden had completed differing amounts of (upper secondary) education at the time they took a set of cognitive tests in preparation for military service. The differences are conditionally random, as they occurred due to (testing) capacity constraints, allowing the authors to estimate a causal effect of schooling on cognitive skills. Using that some of the participants took the test before and some after the summer holiday, the authors can separate the effect of additional education from that of age. The authors find that even as little as ten days of additional schooling significantly raises test scores by 1% of a standard deviation (corresponding to 18% of a standard deviation for a full school year).

Öckert (2021) provides an extensive review of this literature, with particular emphasis on studies from education systems similar to those found in the Nordic countries. He concludes that there is overwhelming evidence that the amount of time spent in school affects learning and later labour market prospects: Estimates vary across studies, but many suggest that one additional year of schooling improves performance by around 20–30% of a standard deviation. Estimated effects tend to be largest for the youngest students and decrease thereafter. Apart from Sweden and Iceland, primary and middle schools in the other Nordic countries closed and moved to remote instruction for 4–9 weeks in the spring of 2020. Bearing this in mind, the (short term) impact on test scores would be expected to vary from 2.5–6% of a standard deviation⁴³ for those with the weakest ability and poorest home conditions (assuming they did not learn anything) to no change at all (in cases where remote instruction and home schooling fully compensated for the reduction in classroom teaching).

Several papers in this strand of the literature have also been able to capture more long-term impacts of more teaching time; for instance, effects on the amount of completed schooling or later earnings as adults (e.g., Oreopoulos 2006; Pischke 2007; Jaume and Willén 2019; Fischer et al. 2020). Many of these papers exploit educational reforms, for example, prolongation of compulsory schooling or extensions of the school year to identify causal relationships. Most

⁴³ Schools were closed for 6–9 weeks (out of 38 weeks of instruction) in Norway, i.e., 15–24% of the school year; 4–8 weeks (out of 40 weeks) in Denmark, i.e., 10–20% of the school year; and 8 weeks (out of 38 weeks) in Finland, i.e., 21% of the school year. Assuming a full year of instruction improves performance by 25% of a standard deviation (cf. Öckert 2021), the estimated decline corresponds to 2.5–6% of a standard deviation. Number of teaching days per year for various countries are available at https://stats.oecd.org/Index.aspx?datasetcode=EAG_WT_ORG.

studies seem to conclude that more schooling leads to higher earnings, but there are also some examples of cases where this is not found to be the case (e.g. Pischke and von Wachter 2008; Grenet 2013). In his review, Öckert (2021) concludes that most evidence indicates that the effects of time spent in compulsory schooling also persist later in life, and that one additional year of teaching seems to increase income by about 2–3%. Based on this estimate, 4–9 weeks of school closure would correspond to future decreased earnings of at most 0.3–0.6% (if the students did not learn anything during the time schools were closed). It should be emphasised that this approximation relies on numerous uncertain elements, as estimates vary across studies, and it does not take into account that effects are likely to differ by, e.g., student age, socioeconomic background and school subject.

6.2 Impact of reduced class size

As discussed above, it is possible that some of the expected negative impacts of school closures would be offset by teaching sometimes taking place in smaller groups (to facilitate social distancing). There is a vast literature on the impact of reducing class size on educational performance; see Rockoff (2009) and Öckert (2021) for reviews. Krueger (1999) and Angrist and Lavy (1999) are two well-known studies finding positive short-term impacts on test scores and which both rely on credible identification strategies. While the former is based on a famous experiment in the US where children were randomised to classes of different sizes (project STAR⁴⁴), the latter exploits quasi-experimental variation in class size occurring due to a maximum class size rule in Israel.⁴⁵ The latter approach has been followed by similar studies in other countries. For instance, Fredriksson, Öckert, and Oosterbeek (2013) use the same approach in Sweden and conclude that one less student in the class during grades 4–6 improves cognitive performance by around 3% of a standard deviation. There are also indications of long-term positive impacts of reduced class size in terms of education and later labour market outcomes in adulthood (e.g., Chetty et al. 2011; Browning and Heinesen 2007; Fredriksson, Öckert, and Oosterbeek 2013). The literature is, however, not conclusive; see, for example, the review by Rockoff (2009). Angrist et al. (2019) and Leuven, Oosterbeek, and Rønning (2008) use the same empirical approach as Angrist and Lavy (1999) on data from Norway and Israel, but find no impact of class size on student performance, and Leuven and Løkken (2020) find no impact on later earnings. Moreover, Chetty, Friedman, and Rockoff (2014) show that students assigned to high quality teachers have better long-term educational and labour market outcomes. An

⁴⁴ The Tennessee Student/Teacher Achievement Ratio experiment.

⁴⁵ Krueger (1999) estimates that one additional student in the class reduces test scores by around 3% of a standard deviation. The effects are larger for minority students and students receiving free school meals. Angrist and Lavy (1999) report that their estimates are in the low end of those found in the STAR experiment.

implication of the above is that the potentially positive effect of smaller classes might be offset by poorer quality teachers (Jepsen and Rivkin 2009; Dieterle 2015). This may be the case if fewer students per teacher was made possible by recruiting other (less qualified) staff to do the teaching, as seems to have been the case during the pandemic in Norway, for example (Norwegian Directorate for Education 2021c). All in all, it is not clear based on previous literature to what extent we should expect a reduced class size to compensate for the reduced amount of teaching many children have received during the pandemic.

6.3 Impact of family environment

Parents have had to step in during the pandemic. The younger the children are, the more dependent they are on assistance in learning in the absence of a teacher. But not all families are equally capable of handling this additional responsibility. It is well known that family background has a decisive influence on the process and intergenerational transferability of human capital. For instance, using changes in compulsory schooling laws, Oreopoulos, Page, and Stevens (2006) estimate the causal contribution of parental education on children's educational outcomes. Their results suggest that parents completing compulsory school reduces the likelihood of their offspring repeating a grade or dropping out of high school. Björklund and Salvanes (2011) examine how much of the inequality in educational attainment that can be explained by factors that siblings share. Summarising estimates from several studies, they conclude that a lower bound on the share of variation in years of education that stem from family background factors (including community factors) is in the range of 40–60%, of which parents' education accounts for just around one third. Socio-emotional skills also play an important role, and research shows that non-cognitive competencies vary systematically by socio-economic status (see, e.g., Carneiro, Crawford, and Goodman 2007). Typical socio-emotional skills include the ability to interact with others, but also to focus, pay attention, and to be organised. Such skills are important for several reasons and facilitates the accumulation and utilisation of cognitive skills (e.g., Cunha and Heckman 2008).

Research also shows that time invested and dedication to help children with their schoolwork vary with socioeconomic background. For instance, Andrew et al. (2020) compare time use before and during the COVID-19 pandemic in homes with school children (aged 4–15) in the UK and reach the following conclusions: 1) there are socioeconomic inequalities in learning time, which have increased for smaller children during the pandemic; 2) differences in school-provided learning were magnified by differences in resources at home, including lack of space; 3) since children have spent more time at home during the pandemic, inequalities in home circumstances are likely to have a greater impact on educational attainment and well-being than otherwise. Based on a German time-use study, Werner and Woessmann (2021) conclude that the pandemic's impact

on children's learning opportunities varies by socioeconomic status also in Germany. The UK and German patterns are not representative of the Nordic countries, where school lockdowns generally have been less extensive and access to digital technology, which facilitates remote teaching, is more widespread. However, the pattern that high-SES parents compensate more for lost school inputs than low-SES parents has previously been found in Sweden, too (Fredriksson, Öckert, and Oosterbeek 2016).⁴⁶ Moreover, children of foreign parents with insufficient knowledge of the native language risk being especially negatively affected.

It is also important to note that the pandemic has brought additional challenges to many families. Job insecurity and job loss have, for instance, been either a threat or a reality for many households, potentially increasing parental stress, which in turn can negatively impact children.⁴⁷ Previous research indicates that economic shocks to the family unit, such as parental job loss, can negatively affect children's school performance (e.g., Rege, Telle, and Votruba 2011; Stevens and Schaller 2011). However, not all studies find such an effect from parental unemployment (e.g., Mörk, Sjögren, and Svaleryd 2020), and varying effects may be due to the extent to which different welfare state institutions (e.g., benefit schemes and educational institutions) manage to protect family members against the impacts of negative income shocks. It is conceivable that school closures have made children more exposed to the potential negative effects of increased stress among parents than if schools had remained open.

6.4 Impact of cancelled exams

As discussed previously, remote teaching naturally makes assessment and grading more difficult. All of the Nordic countries (except Iceland) also cancelled many standardised national exams, which further complicated objective assessments of students' knowledge. The loss of this information may delay the recognition of both high potential and learning difficulties in pupils and may thus have harmful long-term consequences for the individual child's learning (Andersen and Nielsen 2020).

Standardised exams have an important role to play in capturing bias. Prior research indicates that there are systematic deviations in grading between unblind and blind examinations, and several studies have documented a teacher bias against boys (e.g., Lavy 2008; Lekholm and Cliffordson 2009; Berg, Palmgren, and Tyrefors 2020) and some others against certain ethnic minorities (e.g., Burgess and Greaves 2013; Hinnerich, Höglin, and Johannesson 2015). While it

⁴⁶ It is possible that two months of summer holidays, in addition to one–three months of school closure in the spring of 2020, will contribute to further disproportionately affect learning by family background (cf. Stewart, Watson, and Campbell 2018). For instance, Alexander, Entwisle, and Olson (2007) calculate that, by age 14, the accumulated disadvantage from the summer holiday may account for as much as two-thirds of the attainment gap between the richest and poorest children.

⁴⁷ There is evidence that economic hardship increases parental depression, which in turn places strain on the parent-child relationship (e.g., Williams and Cheadle 2016).

is not clear how this has played out during the pandemic, it is possible that the fact that teachers' assessments have replaced national exams could have particularly disfavored certain groups of students.

Cancelling important exams is also likely to affect how much effort students put into their schoolwork. Hvidman and Sievertsen (2021) use a reform-induced recoding of student GPA in Denmark in 2007 to show how students adjust their effort when 'high-stakes' are involved, in that the students work harder to achieve better grades if this increases their chances of university enrollment. The empirical literature on graduation standards often finds that increasing standards, for example, by the introduction of final exams, induces some students to perform better, while also tending to lead to higher dropout rates among less able students (e.g., Figlio and Lucas 2004; Dee and Jacob 2006; Ou 2010). Cancelled national exams may thus have heterogenous impacts on students: weaker (upper secondary school) students may, to a greater extent, have chosen to remain in education, as the decreased dropout rate in Norway suggests (Norwegian Directorate for Education 2021a). Other students may have chosen to put in less effort, resulting in a lower learning gain. Studies (OECD 2021b; Swedish NAE 2021d) suggest that they might still have received just as high (or even higher) grades, but despite these grades, they are likely to be less prepared as they enter working life and/or higher education.

7 Conclusion

Based on available evidence of the impact of distance learning and the amount of teaching time, we have discussed expected effects of the pandemic-induced school closures on student outcomes in the short and long term. In doing so, we have taken into account the preparedness of the Nordic education systems for a transition to remote instruction as well as various reports summarising student and teacher experiences.

Reviewing the literature on the effects of the number of teaching hours, we saw that 4–9 weeks of missed teaching in school (which corresponds to the length of school closures in primary and middle schools in Norway, Denmark and Finland in the spring of 2020) may lead to reduced earnings in adulthood by 0.3–0.6% if no policies are put in place to compensate for the setback the pandemic has caused on skill formation. It must be emphasised, however, that estimates vary across studies, implying that these types of approximations are characterised by great uncertainty. Such a learning loss – and subsequent income loss – can be expected if the schooling that took place at home was far less effective than the usual teaching at school (and is more appropriately described as the absence of schooling). Since the effectiveness of home schooling depends on the resources available in the home, especially parental resources, children from socioeconomically disadvantaged homes can be expected to suffer larger learning losses from school closures than

children from more advantaged homes. And since younger children are more dependent on assistance from parents, learning losses are likely to be particularly large for younger children (cf. Andrew et al. 2020; Blikstad-Balas et al., 2022). Evidence from school closures in the Netherlands during the pandemic points in this direction: less seems to have been learned during school lockdowns, at least by the youngest students (Engzell, Frey, and Verhagen 2021; Haelermans et al. 2021). A recent preprint from Denmark, however, suggest that young students in Denmark actually fared relatively well during the pandemic, at least in terms of reading performance (Birkelund and Karlson 2021).

In cases where remote teaching is just as effective as classroom teaching in the school (and grading standards are not affected), we naturally should not expect any long-term negative effects on human capital and subsequent earnings. However, reviewing several surveys of children (or their parents) and teachers conducted in the Nordic countries during the COVID-19 pandemic, we saw that teachers and students generally agree that the quality of education has not lived up to the same standard during periods of distance learning. The literature on impacts of distance learning *per se* has mainly focused on short-term learning effects but points to several clear and consistent patterns: *i)* remote teaching is on average less effective than classroom teaching (although estimates vary in size across studies); *ii)* the effectiveness is closely linked to student ability – it is the weakest student groups that are most negatively affected by distance learning; the academically strongest students do not necessarily perform worse in comparison to when being taught in the classroom. Remote instruction also seems to be less effective, the younger the age of the students involved.

All in all, it is clear from the literature that school closures can be expected to have long-term negative effects on skill formation and earnings if no mitigating policies are put in place, and that these losses are unlikely to be equally distributed: The negative impacts are likely to be larger for more disadvantaged students, and larger the younger the students have been when exposed to remote instruction. The negative effects can also be expected to increase monotonically with the length of the school closure.⁴⁸ It is also likely that the effectiveness of remote instruction varies depending on the subject, although there is so far limited causal evidence of this.

When it comes to compulsory schooling, we should expect there to be a higher fraction of students in Norway, Finland, and Denmark who risk being negatively affected compared to Sweden, which (for the most part) kept all compulsory schools open. Iceland probably represents an intermediate position in this regard. The negative impacts on students in upper secondary school can be expected to be more similar across the Nordic countries. Moreover, we saw that

⁴⁸ However, whether we should expect the relationship to be linear is unclear as a longer duration of distance learning may involve adaptation that improves the effectiveness of the teaching. Alternatively, it could also make it harder for students to remain motivated, resulting in reduced effectiveness.

there has been a substantial amount of regional variation in the extent and duration of school closures in all of the Nordic countries, as policies have varied depending on regional infection rates. Different schools have also adopted different strategies, which may vary by, for example, the form of school management, resources and school size. Thus, within each country, there will be schools and regions where students are likely to have been more severely affected than elsewhere in the same country. This is important to bear in mind when developing policies designed to counteract the expected negative effects on student learning.

Although remote teaching seems to be less effective the younger the students are, the potential negative impacts for older students should not be downplayed – in all the Nordic countries, upper-secondary students have had far more distance learning than younger students. In addition, there is now less time available to compensate this group for shortcomings in their learning environment over the last two years. Students in vocational tracks constitutes a group of particular concern, as the pandemic is likely to have limited their possibilities of taking part in work-place based learning. Moreover, the potential consequences of cancelling national exams for student learning and later outcomes should not be ignored.

The discussion in this paper has partly been based on research conducted before the COVID-19 pandemic, and the pandemic has given rise to many special circumstances that have made children and youth particularly vulnerable, possibly aggravating the expected negative effects of school closures. Job insecurity and job loss have been a reality or threat in many households, potentially increasing parental stress that also could have negative impacts on children. School closures, in combination with other measures to ensure social distancing, have often meant that children and youth have for periods been largely isolated from their normal social contexts. As we saw in Section 4, some studies indicate that depressive symptoms have increased among youth (Thorisdottir et al. 2021; Evensen et al. 2021). Although the evidence on this from the Nordic countries is not conclusive, this is a concerning observation as mental health problems in adolescence have been found to be associated with worse long-term outcomes in terms of health, education and labour market prospects.⁴⁹ For those student cohorts who have left school during the pandemic, the (expected) negative impacts of distance learning may be further exacerbated by graduating during an economic downturn.⁵⁰

⁴⁹ It is documented that the onset of mental disorders usually occurs in childhood or adolescence (e.g. de Girolamo et al. 2012). Longitudinal studies show that early onset of mental disorders rarely remits spontaneously and contributes to explain the burden of mental disorders in adulthood (see e.g. discussion in Wittchen et al. 2011). Mental health problems in adolescence have been linked to poor educational outcomes and increased risk of NEET status (Not in Employment, Education or Training) (Veldman et al. 2015; Esch et al. 2014).

⁵⁰ Studies of previous recessions find that youths who enter the labour market during a recession have worse labour market outcomes also in the long-term, compared to those who graduate when the economy is stronger (see Engdahl 2021 for a review of this literature).

The size of the long-term effects of school closures will eventually depend on how long the pandemic continues to affect the school system and the extent and scope of policies put in place to counteract the potential negative learning impacts of school closures. The recent preliminary results from Denmark in Birkelund and Karlson (2021), provides a rather optimistic picture as they suggest that large learning losses could be counteracted by mitigating policies.

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