

COVID-19 school closures and cumulative disadvantage: Assessing the learning gap in formal, informal and non-formal education

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Abstract

Reducing physical contact has been the most common strategy adopted by governments to reduce the spread of the COVID-19 disease. It has led most countries to close their schools. Previous evidence on the effects of teacher strikes, summer holidays, armed conflicts or any other cause of school closure on learning suggest that the effects of COVID-19 will be highly significant for some and will vary depending on students' previous performance, family characteristics, age or education track, among other factors. Recent evidence shows that learning losses during school closures have been widespread and especially intense among the more disadvantaged students. In this article we evaluate the magnitude of the gap regarding opportunities to learn in formal, informal and non-formal education between families depending on their cultural and economic capital. An online survey ($n = 35,937$) was carried out during the second week of the confinement (March 2020) in Catalonia. The survey targeted families with children between three and eighteen years. The responses show remarkable social inequalities in opportunities to learn. In this article, we describe the magnitude of the learning gap between social groups and explore which are the most significant factors that explain educational inequalities. Our

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findings reveal a process of cumulative disadvantage that results from unequal opportunities in formal, informal and non-formal education and underline the need to address both school and family factors to mitigate the impact of the pandemic on learning opportunities.

1 | INTRODUCTION

In March 2020, the regional Governments in Spain decided to close schools as a strategy to reduce physical contact and to control the spread of COVID-19. Early information about the disease mistakenly hypothesised that children were an important vector for spreading the virus, this led to millions of children and young people being confined in their homes. Several international organisations have expressed their concerns about the educational situation of 168 million children that have not attended school for a year, and more than 800 million who have experienced temporary interruptions in their education (UNESCO, 2021; UNICEF, 2021).

Neither Spain as a whole nor Catalonia were an exception to this global trend. Despite other services (workplaces, sports centres, public spaces etc.) reopening in April, schools remained closed until the end of the school year. In Catalonia, the lockdown left 735,000 students between three and eighteen years of age with no possibility to attend school.¹ No specific policies for ensuring schooling for at-risk students was set up by the Catalan government between March 2020 and the end of the school year. This left students with no formal learning for six months (until the beginning of the new school year in September 2020).

Despite schools having previously experienced periods of closure, the onset of the COVID-19 pandemic had no precedent in terms of effects on the global economy and social life. In the context of these exceptional circumstances, this article investigates the effect of school closures on learning opportunities for children and young people from different socioeconomic backgrounds and enrolled in different types of schools. Unequal learning opportunities can explain the inequalities that took hold in the acquisition of skills and academic performance and the increase in the gap between students from more advantaged backgrounds and the most vulnerable, a finding that has already been demonstrated in recent studies (Engzell et al., 2021; Maldonado & De Witte, 2020; Nelson & Sharp, 2020).

In order to measure exposure to learning during school closures, we administered an online survey 26 to 30 March, 2020. We hypothesised that exposure to learning (in formal, informal and non-formal education)² among children from disadvantaged households was likely to be lower than for their peers from families with higher economic and cultural capital. Based on the results of our survey, this article reflects on how school closures produce unequal learning opportunities in terms of both formal and non-formal education and how students' social backgrounds and lockdown conditions were associated with their learning opportunities. While in a previous article we described how the lockdown increased the learning gap between groups of students who came from different socioeconomic backgrounds (Bonald & González, 2020), this article provides more detailed measures of the different opportunities to learn in formal, non-formal and informal education, we also expand on the mechanisms that deepen the educational disadvantages of some students in a context of schools being closed and the presence of a digital divide.

The article is structured as follows. We start with a review of evidence on learning losses and their unequal impact on different groups of students due to past and current periods of school closures. In the following section we describe our methods (survey design and data analysis approach). The next section presents key findings regarding inequalities in opportunities to learn in formal, informal and non-formal education. Finally, the paper reflects on the cumulative effect of educational inequalities in the three learning domains and discusses some implications for compensatory policies.

2 | CLOSED SCHOOLS AND SOCIAL INEQUALITIES

Research on the educational effects of school closure during the COVID-19 pandemic is abundant. Evidence from contexts where there has been an assessment of the impact of the replacement of onsite schools by online learning shows that education has been strongly affected by the pandemic. According to results from the United Kingdom (Nelson & Sharp, 2020), Belgium (Maldonado & De Witte, 2020) and the Netherlands (Engzell et al., 2021), learning losses have been widespread and especially intense among more disadvantaged students.

These recent results align with results from previous studies on the impact of school closures on learning outcomes (Abadzi, 2009; Education Endowment Foundation, 2018). When schools reduce opening times or stop functioning for different reasons (summer holidays, natural disasters, teacher strikes or violent conflicts) there is in general a loss of learning. This loss is unequally distributed among students by aspects such as social class, cultural background, and age.

Indeed, research has found heterogeneous (uneven) effects, with children from vulnerable families being the most affected by school disruptions (Belot & Webbink, 2010; Goodman, 2014; Jaume & Willén, 2019; Kuhfeld et al., 2020). Moreover, previous closures caused a more intense negative effect on student learning outcomes in contexts with higher proportions of disadvantaged families (Borse et al., 2011; Chen et al., 2011; Iqbal et al., 2020; Shores & Steinberg, 2018).

Beyond evidence related to school closures, there is extensive research on the reduction of learning time during the ordinary school year (e.g., absenteeism, summer breaks, diminished instructional time). Despite inconclusive findings (Cattaneo et al., 2017), most research suggests that students who are socioeconomically disadvantaged or those with a migrant background are more negatively affected than their peers by the reduction in learning time (Dahmann, 2015; Gromada & Shewbridge, 2016; Huebener et al., 2017).

On average, across 30 OECD countries included in the report *The state of school education: One year into the COVID pandemic* (OECD, 2021), pre-primary schools were completely closed in 2020 for 42 days, primary schools closed for 54 days, lower secondary for 63 days and upper-secondary schools for 67 days. In Spain, as in other European countries, school closures between March and June 2020 merged with the beginning of the summer holidays, resulting in students being absent from school for six months. In many other countries, students did not go back to their normal education until later, as in the case of the United States or Mexico, where classrooms remained closed all of 2020 and for a part of 2021. In other countries, as in the United Kingdom or Germany, schools closed again in the autumn of 2020 after a short period of face-to-face activity. Following OECD data, education systems with poorer results in PISA 2018 were likely to experience longer school closures during 2020. Past studies comparing student learning progress over summer break have consistently shown that achievement tends to slow or decline over the summer holidays in ordinary circumstances. Although there is no agreement on the magnitude of the learning loss (Von Hippel, 2019), it is clear that during the summer period, there is an increase in educational inequalities between socially advantaged children and more disadvantaged ones (Alegre, 2016), that these inequalities are steeper for mathematics than for reading, and are especially acute for students in higher grades (Kuhfeld et al., 2020; Kuhfeld & Tarasawa, 2020).

During the spring of 2020—in contrast to school closures of previous studies—schools managed to maintain some contact with students, mostly through online instruction. However, the digital divide constitutes a barrier associated with online education.

As Van Dijk (2020) states, there is more to the digital divide than access to digital devices and the internet. Inequalities related to the internet and the digital sphere form an inequality structure on three levels, with lack of access merely the most obvious manifestation of this phenomenon. Even if internet access is ensured, the digital divide still exists as long as skills and capacity to use appropriate technologies are not equally distributed among the population. Additionally, the digital divide must be interpreted according to the effects it has on the development of individuals and groups. In this sense, the digital divide cannot be read as merely a consequence of old inequalities but as a process that is constantly reinforcing them. This process will continue as long as those

with higher incomes and higher educational levels have more opportunities for personal development than less educated and poorer groups (Robles & Torres Albero, 2012; Van Dijk, 2020).

The replacement of on-site education by different forms of online schooling has laid bare the existence of a digital divide on three levels. First, there is evidence that a lack of internet connections and adequate devices hindered teachers from contacting many students during school closures in 2020 (Bonal & González, 2020; Jacovkis & Tarabini, 2021; Kuhfeld et al., 2020; OECD, 2021; Van Lancker & Parolin, 2020).

Second, closing schools obliged teachers to acquire new skills and prepare new materials and pedagogical strategies that were adapted to a virtual learning environment. However, neither teachers nor families had access to the same skills or resources to design or follow distance learning. As Jacovkis and Tarabini (2021) state, while more than one third of schools with high percentages of vulnerable students faced significant difficulties in setting students up with distance learning, only 7.5% of middle-class schools considered this to be difficult. The combination of a digital divide and teacher inexperience in providing high-quality distance learning made it difficult to improve students' learning opportunities (Kay et al., 2020).

Third, the COVID crisis and the replacement of many in-person activities by online activities enhanced the effect of the digital divide. It implied the reduction in all manner of opportunities for those excluded from the digital sphere because they either had no internet connection or a poor one, thus affecting many different areas such as health, work or education (The Economist Intelligence Unit, 2021). Remote learning during the lockdown increased the attainment gap between students from different socioeconomic backgrounds (Coe et al., 2020; Goldstein, 2020).

Apart from the digital divide, studies on education have also demonstrated that academic outcomes are tied to parental involvement and the quality of learning at home. Unequal parental capacities to help children with their homework and different uses of family time have been extensively documented (Meyer et al., 2017; Mora & Escardíbul, 2018); these issues become especially important when on-site education is replaced by distance learning (Bonal & González, 2020; Burgess & Sievertsen, 2020).

3 | METHODS

The research on which this article reports sought to analyse how families from different social and cultural backgrounds reacted to the lack of on-site education in 2020. Our goal was to identify factors that condition learning opportunities in formal, non-formal and informal education. We articulated the following three research questions:

1. Were there differences among schools in providing learning opportunities? How did schools guarantee access to education during closures?
2. What type of educational activities did families develop with their children? Is there any relationship between family characteristics and their educational uses of time?
3. Were students able to maintain after-school activities during lockdown? Which differences can be observed by family cultural capital?

These questions aim to understand which factors produced an increase in the educational gap due to school closures in 2020. Our hypothesis was that exposure to learning among children from lower-income households, from immigrant backgrounds and belonging to families with low educational levels was likely to be lower than their peers from higher-income families.

Between 26 to 30 March, 2020, two weeks after school closure, we conducted an online survey with families whose children were aged between three and eighteen years. Our survey comprised 78 questions. A first group of questions referred to social, spatial, and technological aspects of the families' circumstances (such as the size of their homes, the availability of outdoor spaces, access to internet and to digital devices). A second group of

questions included items to assess children's learning opportunities in formal, informal and non-formal education. Finally, the survey included questions to describe respondents' social and economic conditions, such as family structure, parental education attainment, income, ethnic origin, gender and work status.

After a brief pilot was completed, we distributed the final version of the survey through various online communication channels (Twitter, Facebook and WhatsApp). The final sample included information from 35,418 families (addressing a total of 59,167 children aged three to eighteen years). To compensate for the overrepresentation of high-income and highly educated parents in the sample, we used *non-response weighting* to bring the sample closer to the true population distribution. In this way, we weighted the sample by the level of parental education attainment, as a key variable of social and cultural differentiation, in line with census data. Table 1 shows both the weighted and unweighted samples.

Sample distribution by school variables accurately reflects the distribution between the public and private school sectors.³ In Catalonia, the proportion of children in compulsory schooling who attend state schools is 68% (this was 69.9% in our sample), while 29% of students attend private subsidised schools (27.5% in our sample), and only 2% are enrolled in private independent schools (2.6% in our sample). Our sample was also well-balanced in terms of age groups, with a slight over-representation of younger students.⁴

For our data analysis, we constructed some subsamples to carry out specific analyses. In this article, we present some data based on subsamples for older children aged between ten and eighteen. That is, children enrolled in the last two years of primary education (aged ten to twelve), those in lower secondary education (aged twelve to sixteen) and those in post-compulsory academic or vocational education (sixteen to eighteen years).

3.1 | Dependent variable: Opportunities to learn

We evaluated the magnitude of the learning gap in formal, informal and non-formal education between families with higher and lower cultural capital, between richer and poorer families, and between native families and those with an immigrant background. We assessed the learning gap using an index that we call *Opportunities to Learn* (OTL), constructed according to the intensity of the different tasks developed in each domain. To compose the index, which ranged from 0 to 100 points, we normalised indicators and aggregated (combined) frequencies.

To evaluate the learning gap in formal education, our survey included questions regarding how much time children invested in schoolwork every day since the beginning of school closures, how frequent the contact was with their teacher/s, how often they received online lessons, whether they had to complete specific homework tasks, and how often these tasks were reviewed and returned to them.

We calculated OTL in formal education using the following formula:

$$OTL_{\text{Formal}} = \frac{a + b + c + d + e}{5}$$

TABLE 1 Unweighted and weighted survey samples

Parental education attainment	Sample (n)	Sample (%)	Population (%)	Weight (factor)	Weighted Sample (n)
Compulsory education	2,387	6.74	27.4	4.1	9,916
Post-secondary education	9,911	27.98	33.0	1.2	11,689
Higher education	23,121	65.28	39.6	0.6	13,813
Total	35,419	100	100		35,418

Note: In two-parent families, the survey recorded the highest parental education attainment.

Source: Authors.

where a , hours of study per day; b , frequency of online lessons; c , frequency of communication with teachers; d , frequency of homework; e , frequency of receiving feedback.

To assess inequalities in informal learning, we analysed survey questions on family interaction and uses of time. Families were asked how often their children were engaged in a range of activities during the day. The formula for informal learning, OTL_{Informal} , includes as positive values: high frequencies of reading, playing math games, listening to music, dancing, doing sports or practicing languages. These are also activities that are carried out at school in a normal school day. In addition, the OTL_{Informal} included as negative values: high frequencies of playing videogames, using social media platforms, or watching TV; these are activities that can be considered more passive and less related to school dynamics.

We calculated OTL in informal education using the following formula:

$$OTL_{\text{Informal}} = \frac{a + b + c + d + e - f - g - h}{8}$$

where a , frequency of reading alone; b , frequency of doing math games; c , frequency of playing music or dancing; d , frequency of doing sports; e , frequency of practicing languages; f , frequency of watching TV programmes; g , frequency of following social networks; h , frequency of playing videogames.

The final part of the survey included questions about after-school activities. Families were asked about which extracurricular activities their children participated in before the lockdown and whether they kept doing them. The formula for nonformal learning, $OTL_{\text{NonFormal}}$, refers to the number of after-school activities (arts, culture, sports, languages, music, extra support classes, religious activities and technology-related activities) that children practiced during school closures.⁵

We calculated OTL in non-formal education using the following formula:

$$OTL_{\text{NonFormal}} = \frac{a + b + c + d + e + f + g + h}{8}$$

where a , arts activities; b , cultural activities; c , sports activities; d , language lessons; e , scouts; f , music activities; g , extra support classes; h , technology activities.

3.2 | Independent variables

Table 2 synthesises the main variables used in our analyses. For each OTL index we performed a series of linear regressions to predict opportunities to learn in the three educational domains. We ran three regression models to assess the significance of each group of variables. First, Model 1 tested family variables (level of studies, income and family background, taking *compulsory education*, *Income Quintile 1* and *both parents born in Spain* as reference categories). Second, Model 2 included circumstances during school closure (number of devices and number of children living at home). Finally, Model 3 incorporated school variables (child educational level and school sector, using *primary education* and *state school* as categories of reference).

4 | EFFECTS OF SCHOOL CLOSURES ON OPPORTUNITIES TO LEARN DURING COVID-19 SCHOOL CLOSURES IN THE SPRING OF 2020

In this section, we assess which drivers have a stronger effect in a student's opportunities to learn in formal, non-formal and informal education. Three linear regressions are presented and analysed for opportunities to learn

TABLE 2 Independent variables

	Variables	Type	Categories
Family variables	Level of studies	Categorical	Compulsory education Post-compulsory education University studies
	Income Quintiles	Categorical	Quintile 1 Quintile 2 Quintile 3 Quintile 4 Quintile 5
	Parents' place of birth	Dichotomous	Native (at least one parent born in Spain) Immigrant (both parents born abroad)
Confinement conditions	Number of devices per person	Continuous	1–6
	Number of children living at home	Continuous	1–6
School variables	Child education level	Categorical	Primary education Secondary education Vocational training 1st Baccalaureate 2nd Baccalaureate
	School sector	Categorical	Public school Private subsidised school Private independent school

Source: Authors.

(OTL) in formal, informal and non-formal education. Finally, we assess the cumulative disadvantage experienced by different student profiles.

4.1 | Schoolwork and opportunities to learn

As previously described, the OTL index in formal education (OTL_Formal) synthetises information on how much time children invested in schoolwork every day since the beginning of the school closures, how frequent their contacts with school and teacher/s were, how often they received online lessons, whether they had homework, and how often assignments were reviewed and returned to children.

The distribution of the OTL_Formal Index shows that 28.3% of students between ten and eighteen years of age spent less than one hour a day on school tasks, had almost no communication with teachers and did not receive any homework to do or to be reviewed, which meant that they had an OTL_Formal index of zero. At the other extreme, 7.7% of students dedicated more than four hours a day to schoolwork, had frequent contact with their teachers and received regular feedback for school assignments, thus obtaining an OTL_Formal index of 100 (see Table 3).

The linear regression (Table 4) shows that all variables have a significant effect on OTL_Formal in models 1 and 2. Being enrolled in higher grades (older students had a higher OTL_Formal), being native to Spain, living in a higher-income household or having parents with post-compulsory or university education were all factors

TABLE 3 Distribution frequency of OTL_Formal

OTL_Informal	Freq.	Percent	Cum.
0	2,698.56	10.31	10.31
20	3,433.24	13.12	23.44
40	4,544.78	17.37	40.81
60	5,535.70	21.16	61.97
80	5,913.78	22.60	84.57
100	4,036.42	15.43	100.00
Total	26,162.48	100.00	

Source: Authors.

TABLE 4 Regression models of OTL_Formal

	Model 1	Model 2	Model 3
<i>Compulsory education</i>			
Post-secondary education	2.75 ^{***} (.61)	1.73 ^{***} (.61)	1.48 ^{***} (.56)
University studies	3.28 ^{***} (.65)	1.84 ^{***} (.65)	1.51 ^{***} (.59)
<i>Income Quintile 1</i>			
Income Quintile 2	2.27 ^{***} (.59)	1.43 ^{***} (.59)	.74 (.53)
Income Quintile 3	3.52 ^{***} (.57)	2.01 ^{***} (.58)	.69 (.52)
Income Quintile 4	6.07 ^{***} (.89)	3.50 ^{***} (.90)	.64 (.81)
Income Quintile 5	10.60 ^{***} (.66)	7.70 ^{***} (.68)	2.89 ^{***} (.61)
<i>Native parents</i>			
Immigrant parents	-4.46 ^{***} (1.00)	-3.14 ^{***} (1.00)	-2.03 ^{***} (.91)
Devices per person		8.73 ^{***} (.59)	3.62 ^{***} (.25)
Number of children		-1.17 ^{***} (.28)	-1.41 ^{***} (.25)
<i>Primary education</i>			
Lower secondary education			18.32 ^{***} (.40)
Lower vocational training			5.25 ^{***} (1.02)
1st baccaulaureate			25.59 ^{***} (.75)
2nd baccaulaureate			29.39 ^{***} (.81)
<i>Public school</i>			
Private subsidised school			17.57 ^{***} (.40)
Private independent school			24.08 ^{***} (1.01)
Constant	49.94 ^{***} (.52)	46.92 ^{***} (.92)	33.96 ^{***} (.86)
R ²	.019	.031	.215
F	62.12	78.15	390.29
N	24,621	24,621	24,232

Note: Dependent variable: OTL_Formal (0–100). Standard errors in parenthesis. Category of reference in parenthesis. ^{***} $p < .001$; ^{**} $p < .01$; ^{*} $p < .05$; [†] $p < .1$.

Source: Authors.

associated with higher OTL_Formal scores. However, the inclusion of school variables (Model 3) notably increases how well the model fits. Interestingly, income variables are no longer significant when school variables are included (except for the richest quintile). In addition, most variables related to family and lockdown conditions

reduce their coefficients. Students enrolled in state schools presented significantly lower OTL_Formal scores than students enrolled in both independent and publicly subsidised private schools. A significant number of state schools did not organise any specific school tasks during those first two weeks, since they were waiting for further instructions from the Education Department, which had announced that the first two weeks should be considered a non-curricular period, since not all students had adequate conditions to follow the syllabus. Despite this announcement, publicly subsidised private schools and independent schools needed to keep providing educational services due, basically, to their higher dependency on private funding.

4.2 | The role of families in the learning process

The cultural capital and everyday informal practices of families have effects on the learning experiences and opportunities for children, and not just in times of school closure. School closures increase the interactive time between family members and provide unique research conditions for assessing informal learning activities.

Out of students in the ten to eighteen age range, 6% had an OTL_Informal index under 25, meaning that they only did a quarter of the potential educational activities in their leisure time. At the other extreme, 13% of students had an OTL_Informal index over 87.5 points, meaning that they mostly dedicated their time to educational activities such as reading, maths, sports or practising languages, while little time was devoted to watching TV, following social networks or playing videogames. Most students obtained an OTL_Informal between 50 and 75 points (69% of the sample) (see Table 5).

As in the case of OTL_Formal, we ran three regression models to assess which factors influence opportunities to learn in informal educational practices at home (OTL_Informal). Table 6 shows that all family variables included in the regression have a significant effect on students' OTL_Informal. As expected, cultural capital—for which parental educational attainment was used as proxy—has a greater influence than economic capital on families' educational practices. Having an immigrant background significantly reduced the likelihood of accessing informal learning processes. Family circumstances were also significant. However, in this case, living with more children at home increases the informal opportunities for learning. Finally, the inclusion of school variables shows that older students get lower scores at OTL_Informal than primary school students, but that the reduction is especially strong for those who are enrolled in lower tracks of vocational education and training. In addition, OTL_Informal was in general greater for students enrolled in independent private schools. However, the school sector was less influential than observed for OTL_Formal.

TABLE 5 Distribution frequency of OTL_Informal

OTL_Informal	Freq.	Percent	Cum.
0	62.52	0.24	0.24
12.5	314.90	1.20	1.44
25	1,278.60	4.89	6.33
37.5	3,123.02	11.94	18.27
50	5,088.33	19.45	37.72
62.5	6,693.82	25.59	63.30
75	6,178.66	23.62	86.92
87.5	2,838.9	10.85	97.77
100	583.72	2.23	100.00
Total	26,162.48	100.00	

Source: Authors.

TABLE 6 Regression models of OTL_Informal

	Model 1	Model 2	Model 3
<i>Compulsory education</i>			
Post-secondary education	3.37*** (.36)	3.40*** (.36)	3.29*** (.36)
University studies	8.00*** (.38)	7.61*** (.38)	7.17*** (.39)
<i>Income Quintile 1</i>			
Income Quintile 2	2.29*** (.35)	2.32*** (.35)	2.35*** (.35)
Income Quintile 3	2.26*** (.34)	2.28*** (.34)	2.26*** (.34)
Income Quintile 4	1.79*** (.52)	2.06*** (.53)	2.13*** (.53)
Income Quintile 5	4.36*** (.39)	4.25*** (.40)	3.93*** (.40)
<i>Native parents</i>			
Immigrant parents	-3.37*** (.59)	-3.44*** (.59)	-3.68*** (.59)
Devices per person		1.53*** (.35)	1.94*** (.35)
Number of children		1.39*** (.16)	1.25*** (.17)
<i>Primary education</i>			
Lower secondary education			-3.25*** (.27)
Lower vocational training			-12.78*** (.66)
1st baccalaureate			-3.25*** (.49)
2nd baccalaureate			-3.53*** (.53)
<i>Public school</i>			
Private subsidised school			.60*** (.26)
Private independent school			3.11*** (.66)
Constant	54.41*** (.30)	50.49*** (.54)	53.14***
R ²	.0499	.0529	.0730
F	161.54	137.57	112.15
N	24,621	24,621	24,232

Note: Dependent variable: OTL_Informal (0–100). Standard errors in parenthesis.

*** $p < .001$; ** $p < .01$; * $p < .05$; † $p < .1$.

Source: Authors.

4.3 | Inequalities in after-school activities

Most after-school activities (70%) were suspended during lockdown. This circumstance, in addition to already existing inequalities in participation in after-school activities, explains why 43% of children between ten and eighteen years in our sample had an OTL_NonFormal index of 0, meaning that they didn't do any extracurricular activities during the lockdown. Almost 35% of students had an OTL_NonFormal of 12.5, meaning they did only one activity during school closures; 17% managed to do two different activities and 4% of students were able to participate in three or more activities (see Table 7).

Economic and cultural inequalities were marked in the probability of maintaining after-school activities during school closure. As in the case of informal practices, for opportunities to do extracurricular activities families' cultural capital has a stronger effect than economic capital in all the models. Likewise, having access to more technological devices, not being from an immigrant background, or being enrolled in the last years of primary education increased the opportunities to learn in non-formal education during school closures in connection to the pandemic. Interestingly, the school effect is different from the one observed for learning opportunities in formal

TABLE 7 Distribution frequency of OTL_NonFormal

OTL_Nonformal	Freq.	Percent	Cum.
0	11,371	43.70	43.70
12.5	9,028	34.69	78.39
25	4,354	16.73	95.12
37.5	1,099	4.22	99.34
50	165	0.63	99.98
62.5	6	0.02	100.00
Total	26,162.48	100.00	

Source: Authors.

and informal education. With all other variables being equal (income, parents' education, origin and lockdown conditions), students enrolled in state schools have a higher probability of attending after-school activities than those enrolled in private institutions.

There are two main reasons for this difference in after-school activities during school closures in 2020. First, families with higher economic, social and cultural capital participated in activities that were more likely to continue online (e.g., artistic activities, foreign languages), compared to the activities more commonly practised by families with lower capital (e.g., sports). Second, the suspension of after-school activities was also higher among families with lower economic, social and cultural capital, due to difficulties in meeting their costs during times of crisis. For instance, compensatory education activities—which could be undertaken online—were voluntarily suspended by 25% of families who had previously engaged in them. This voluntary interruption was particularly high among children whose parents had only completed compulsory education (80%), compared to those whose parents had a university degree (62%) (see Table 8).

4.4 | The learning gap is a process of cumulative disadvantage

By assessing opportunities to learn (OTL) in formal, informal and non-formal education, we have explored the effect of family variables and school variables as drivers of educational inequality. Our analysis reveals a differential weight of the different inequality factors in opportunities to learn in the three types of education. While family variables explain most of the inequality in informal and non-formal education, school type emerges as the explanatory variable with the greatest impact on opportunities to learn in the formal domain.

However, the axes of inequality are intersectional, meaning that they do not operate independently of each other. For example, the probability of attending a private school, having access to digital devices or being enrolled in vocational training are not equally distributed among the different groups of students analysed. Consequently, beyond the impact that each variable exerts on the probabilities for participating in learning, we must consider the fact that the intersections between variables may lead in some cases to a compensation of educational inequalities, while in other cases it can increase them almost exponentially. To assess how incremental opportunities to learn are, we have calculated a cumulative OTL index composed of the three partial indexes. To calculate this index, we have allocated a hypothetical distribution of time between formal, informal and non-formal education in a normal school day. We have given a weight of 60% of time to school tasks, 25% as time for interacting with family and friends and 15% to after-school activities. This cumulative OTL index can be calculated for all students and for specific *student profiles*. Figure 1 illustrates the cumulative OTL index for two student profiles. The first profile represents a child, in a family with comparatively lower education, who attends a state school. The second represents a child, with parents who have university education, enrolled in a private independent school.

TABLE 8 Regression models of OTL_NonFormal

	Model 1	Model 2	Model 3
<i>Compulsory education</i>			
Post-secondary education	2.71*** (.20)	2.70*** (.20)	2.69*** (.21)
University studies	6.05*** (.21)	5.71*** (.22)	5.62*** (.22)
<i>Income Quintile 1</i>			
Income Quintile 2	1.55*** (.19)	1.55*** (.19)	1.65*** (.19)
Income Quintile 3	2.42*** (.19)	2.39*** (.19)	2.50*** (.19)
Income Quintile 4	.93*** (.29)	1.06*** (.30)	1.40*** (.30)
Income Quintile 5	3.77*** (.22)	3.61*** (.22)	3.96*** (.23)
<i>Native parents</i>			
Immigrant parents	-1.36*** (.33)	1.39*** (.33)	-1.48*** (.33)
Devices per person		1.39*** (.19)	1.64*** (.20)
Number of children		1.01*** (.09)	1.05*** (.09)
<i>Primary education</i>			
Lower secondary education			-.87*** (.15)
Lower vocational training			-3.78*** (.37)
1st baccalaureate			-.95*** (.28)
2nd baccalaureate			-2.02*** (.30)
<i>Public school</i>			
Private subsidised school			-1.23*** (.15)
Private independent school			-2.24*** (.37)
Constant	3.61*** (.17)	0.60*** (.30)	1.53*** (.32)
R ²	.0900	.0954	.1047
F	304.45	259.44	166.58
N	24,621	24,621	24,232

Note: Dependent variable: OTLNonFormal (0–100). Standard errors in parenthesis.

*** $p < .001$; ** $p < .01$; * $p < .05$; † $p < .1$.

Source: Authors.

For all opportunities to learn, without exception, the odds of being exposed to learning experiences were lower in the first profile, resulting in a cumulative disadvantage of almost 20 points. As Figure 1 shows, Profile 1 (child with parents with lower cultural capital and attending a state school) received lower scores in the three domains in comparison to Profile 2 (child with parents with higher cultural capital and attending a private school). The main differences are observed in OTL_Formal, meaning that the inequality in exposure to learning is mainly explained by decisions made by each school, rather than by the circumstances of individual families.

5 | CONCLUSIONS

Our analysis shows evidence for, and details how, student exposure to learning in formal, informal and non-formal education during school closures in 2020 in Catalonia was highly unequal. Differences in how schools responded, the different abilities of families to support education, and differences in families' cultural practices or possibilities to maintain after-school activities explain the widening of the learning gap between different groups of students.

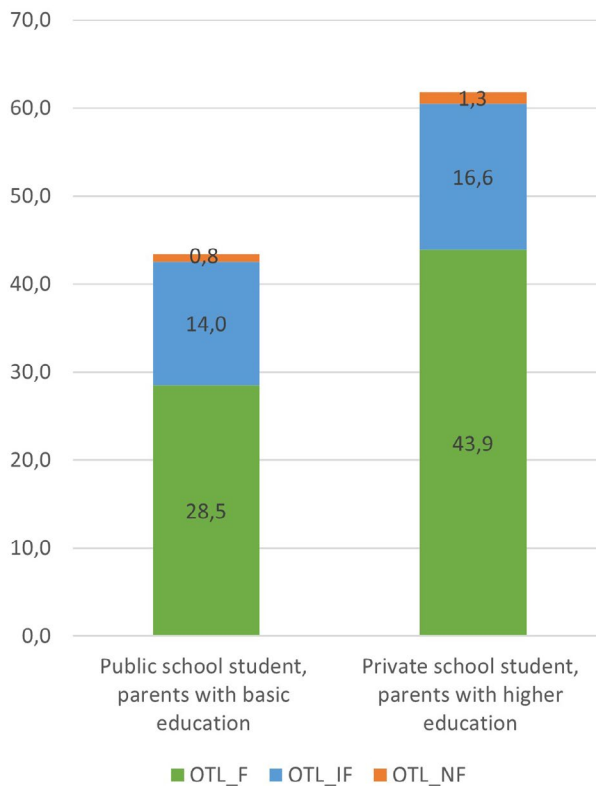


FIGURE 1 Cumulative opportunities to learn (OTL) for two student profiles. *Source:* Authors [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

The digital divide and marked differences in access to and use of technological devices among students left some children and young people without options to connect to learning for at least three months. The gap in opportunities for accessing technological devices is a clear disadvantage factor for both formal and non-formal education, especially for households with several siblings, who all share technological devices. However, informal educational practices do not require children to be online, and a higher number of siblings may even facilitate a higher diversification of activities, as our findings show.

Although lack of access to digital devices has a negative impact on opportunities to learn, the effects of different types of schooling are clearly more intense in the formal domain. Different reasons can explain differences in opportunities to learn between public and private schools. For example, the first two weeks after COVID-19 school closures started in 2020, were considered a non-curricular period by the Catalan Department of Education. This regulation should have been followed by all schools, including publicly subsidised private schools, but, as the data shows, state schools were more likely to cease their teaching activities than the publicly subsidised private ones. Schools reacted differently to the new circumstances, and these different reactions generated different learning opportunities in formal education. Somewhat paradoxically, a domain in which educational policy could show its potential to mitigate socioeconomic differences actually caused an increase in educational inequalities. Periods of school closures highly reduce this potential for mitigation and transfer any compensatory action to the out-of-school realm, which is usually more unequal than formal schooling.

Our data show that school type has a stronger effect on learning opportunities than family characteristics. These results require clarification. As already stated, most state schools ceased their teaching activities. With state schools being more heterogeneous in terms of social composition (compared to private ones), it is probable

that once schools resumed their activities online, differences between families from different backgrounds increased. In other words, with all schools offering the same online opportunities to learn, unequal family resources were likely to have an even sharper effect on learning opportunities, as the literature has widely shown (Belot & Webbink, 2010; Borse et al., 2011; Chen et al., 2011; Goodman, 2014; Iqbal et al., 2020; Jaume & Willén, 2019; Kuhfeld et al., 2020; Shores & Steinberg, 2018).

Indeed, our analysis shows that families with a lower level of parental education attainment have fewer resources and less knowledge to help their children with school tasks. These shortcomings become more acute when demands for autonomous work by students increase and parental support is more difficult. Digital media and the use of the internet in the field of education has not only reproduced but actually worsened existing social inequalities, as research on the digital divide has clearly demonstrated in other fields (The Economist Intelligence Unit, 2021; Van Dijk, 2020). Following Van Dijk, this inequality must be understood widely, in terms of access to opportunities in life. It refers not only to unequal access to and use of digital media for school purposes, but also to barriers for personal development. In line with these categories, our results show that online education amplifies different outcomes in terms of life opportunities, i.e., differences caused by other social variables (such as social class or origin).

In addition, family cultural capital also shapes everyday informal learning practices. Families with higher cultural capital develop informal practices that are more aligned with school logic and with what is considered valid knowledge. Likewise, differences in after-school activities are also high since the activities practiced by wealthier families were easier to maintain during the lockdown.

Differences in exposure to learning are cumulative in the three domains in a way that decreases educational opportunities for children from immigrant backgrounds and children from lower socioeconomic backgrounds. The cumulative disadvantage caused by school closures counteracted benefits of the socialisation provided by education for the most vulnerable children. It also disrupted guidance and supervision processes which are especially important for teenage students in their study, work, and life transitions.

Whilst our study could not provide detailed measures of learning losses (lack of access to academic performance data), it helps us to understand how mechanisms that increase the learning gap between advantaged and disadvantaged students operate. The cumulative characteristics of the learning gap in formal, non-formal, and informal education reveal that learning differences are not the simple result of the absence of schooling but are the result of unequal opportunities for learning in other domains, ones that are key to understanding how educational inequalities are generated and reproduced.

The closure of schools caused by the COVID-19 pandemic poses enormous challenges for developing effective policies to compensate for learning losses and learning inequalities. The increasing cumulative disadvantage and the learning gap will require a significant investment in human and material resources to ensure that the most vulnerable children can catch up. So far, neither the national or regional governments have defined a specific emergency plan with social and educational objectives to repair children's socio-emotional and cognitive skills. EU funds supporting the *Next Generation* recovery strategy will increase educational budgets significantly for the coming years, which will mainly improve digital connectivity for schools and families, and teacher skills for digital education. However, much more will need to be done if the economic, social and psychological costs of this crisis are to be addressed. Otherwise, the right to education for all will not be guaranteed.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

- ¹ In Spain, basic education is organised into three levels: non-compulsory preschool (aged three to five); primary (aged six to eleven) and lower secondary education (aged twelve to sixteen). Post-compulsory secondary education includes a vocational track—which gives access to tertiary technical education—and an academic track (*Bachillerato*)—which gives access to university studies.
- ² *Formal education* refers to traditional schooling followed by university or college. *Non-formal education* refers to any organised educational activity, designed for a particular learning group with clear learning objectives, outside the established formal system. A third kind, *informal education*, refers to experience-based and often accidental learning, occurring e.g., at home or during a leisure activity.
- ³ In Catalonia, public (state) schooling is funded by the government, while parents pay full fees for private (independent) schooling. Subsidised private schools are formally free of charge, but all of them ask for *voluntary* contributions from families (a kind of hidden fee).
- ⁴ Data for the overall population were taken from the online database of the Institut d'Estadística de Catalunya [Statistical Institute of Catalonia] (2020).
- ⁵ We are aware of the different nature of these activities and their varying potential roles for learning. Our data, however, does not allow us to differentiate according to the qualitative characteristics of these activities, so we have opted for quantifying the number of activities students were engaged in, as a proxy of the continued nature of non-formal educational practices.

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