

# Learning Loss during the Covid-19 after Two Years Schools Closure: A Review

Dian Septi Anifa Chusna<sup>1</sup> and Sri Andayani<sup>2</sup>

<sup>1</sup>Magister Student of Mathematics Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Yogyakarta, Indonesia

<sup>2</sup>Mathematics Department, Faculty of Mathematics and Natural Sciences Universitas Negeri Yogyakarta, Indonesia

**Abstract:** For the past 2 years, the Covid-19 pandemic has been disrupting education systems around the world. The pandemic forced the school shutdown and then impacted the student's academic learning. The learning loss was being experienced by students of the whole world. To investigate this condition, the authors analyze the documented learning loss that was affected by the Covid-19 pandemic. This systematic review to see the recorded learning losses as the impact of school closures due to the Covid-19 pandemic. Based on research results, more than 1 million articles were obtained, and nine studies were identified. Seven of nine articles found that learning loss impacted students. Most of the studies said primary students experienced learning loss in various subjects. Several factors of the learning loss were parental education, parental income, teachers' practice in the school and include low-ICSEA schools. Suggestions for future research is more focus on documents of school reflections about education during the Covid-19 pandemic and the school anticipation to decrease the student's learning loss for accelerating the recovery of education.

**Keywords:** Learning loss. Covid-19. Education. Literature review.

## 1. Introduction

Period 2020-2022 was a scary year for all countries in the world, especially regarding the spread of the Covid-19 disease. For the past 2 years, the Covid-19 pandemic has been disrupting education systems around the world, significantly affecting the foremost vulnerable learners. UNICEF reported there are over 616 million students stay affected by the complete or partial closure of the school[1]. In December 2021, UNICEF said there are more than 1.5 billion students who have been out of school because of national shutdowns[2].

The Covid-19 disease forced school closures. Based on the UNICEF report, nearly 80 percent of schools in the world have been closed withinside the first 12 months of the crisis[2]. The pandemic has been running for more than two years, some countries have returned to new normal, some other countries are still running distance learning. This condition led to a change from conventional lectures to remote learning. Even though there have been many challenges in practicing distance learning, several countries around the world implemented teaching remotely. The challenges include digital learning loss and access to digital learning tools[3].

Learning loss was describing declines in students' skills and knowledge[4]. This condition happen when there were inequality on test academic result before and aftger pandemic. For the past 2 years, the Covid-19 pandemic has increased inequality in education such as the access to learning[5]. School closure impacted students who could stay at home. Because of the inequality condition of the home, the student could not access all educational opportunities[3]. Moreover, parental education and parental income are a factor in learning inequality[6].

Most studies found the negative impact of schools shut down in the world, for example in the Netherlands[6], Turkey[7], US States[8], Germany[9], and Norway[10]. Based on a UNICEF report, Covid-19 makes the worst disaster for kids UNICEF has visible in its 75-year history[2]. Children have misplaced primary numeracy and literacy skills. The disruption to education has intended millions of kids have missed out on the educational knowledge from the classroom[1].

The purpose of this study is to see the recorded learning losses as an impact of Covid-19 pandemic. By using systematic review, this study has focused to associate the data documented in the international peer-reviewed journal or conference. This study draws an analysis of students’ learning loss during the pandemic documented between March 1, 2020, and March 30, 2022.

## 2. Method

This study is classified as a literature review. A full search of the literature using an English-language article was published between March 1, 2022, and March 30, 2022. Searching articles by Google scholar using the keywords “learning loss” combined with “Covid-19”, found more than 1 million articles which were then identified, and article abstracts were screened. Along with this, nine articles remain (Table I). The criteria for inclusion used in this article for relevant studies were:

- The article is an article and not a report, a book chapter, or an abstract.
- The article is published by an international journal and indexed in Scopus or Scopus-indexed conference.
- The article is written in English.

The exclusion criteria were:

- The article was published before the spread of Covid-19 diseases.
- Learning loss is not the focus of the paper and is only mentioned as an example.

## 3. Result and Discussion

All studies were summarized with concerning various categories, such as researcher and year, title, country, closure length, educational level, subject, any learning loss or not, sample size, and result. The summaries of all categories were then detailed in Table I.

TABLE I: Studies Included

Researcher (Year)	Title	Country	Closure Length	Educational Level	Subject	Learning Loss	Sample size	Result
Andrew E. Clark, Huiyu Nong, Hongjia Zhu, Rong Zhu (2021)	“Compensating for academic loss: Online learning and student performance during the COVID-19 pandemic”[11]	Chinese	3 months	Secondary (Grade 9)	Chinese, Math, English, Politics, and History	Insignificant	1835 students	“Taking a difference-in-differences approach, we find that receiving online education during the COVID-19 lockdown improved student academic results by 0.22 of a standard deviation, relative to pupils without learning support from their school.”[11]
Carla Haelermans, Roxanne Korthals, Madelon Jacobs, Suzanne de Leeuw, Stan Vermeulen, Lynn van Vugt, Bas Aarts, Tijana Prokic-Breuer, Rolf van der Velden, Sanne van Wetten, Inge de Wolf (2022)	“Sharp increase in inequality in education in times of the COVID-19 pandemic”[6]	Netherlands	12 weeks	Primary (Grade 1-5)	Reading, Spelling and Math	Significant	300,000 students	“The results show large inequalities in the learning loss based on parental education and parental income, on top of already existing inequalities. The results call for a national focus on interventions specifically targeting vulnerable students.”[6]

TABLE I: (Continued)

Researcher (Year)	Title	Country	Closure Length	Educational Level	Subject	Learning Loss	Sample size	Result
Çigdem Haser, Oguzhan Dogan, Gonul Kurt Erhan (2022)	“Tracing students’ mathematics learning loss during school closures in teachers’ self-reported practices”[7]	Turkey	Spring 2020	Primary (Grade 5-6) Secondary (Grade 7-8)	Math	Significant	28 teachers	“Students’ lack of participation, teachers’ limited use of methods to teach mathematics, the socio-economic status of families and their lack of collaboration with teachers were among the reasons for mathematics learning loss.”[7]
Clare Halloran Rebecca Jack James C. Okun Emily Oster (2021)	“Pandemic Schooling Mode And Student Test Scores: Evidence From Us States”[8]	US States	Not specified	Primary (Grade 3–6) Secondary (Grade 7-8)	English Language Art and Math	Significant	Not specified	“We find that pass rates declined compared to prior years and that these declines were larger in districts with less in-person instruction. Passing rates in math declined by 14.2 percentage points on average; we estimate this decline was 10.1 percentage points smaller for districts fully in-person. Changes in English language arts scores were smaller.”[8]
Markus Wolfgang Hermann Spitzer, Sebastian Musslick (2021)	“Academic Performance of K-12 students in an online-learning environment for mathematics increased during the shutdown of schools in wake of the COVID-19 pandemic”[12]	German	Not specified	Secondary (Grade 12)	Math	Insignificant	More than 2.500 students	“found that students’ performance increased during the shutdown of schools in 2020 relative to the year before.”[12]
Per Engzell, Arun Frey, and Mark D. Verhagen (2021)	“Learning loss due to school closures during the COVID-19 pandemic”[3]	Netherlands	8 weeks	Primary (Grade 3-6)	Math, spelling, reading	Significant	350.000 students	“Our results reveal a learning loss of about 3 percentile points or 0.08 standard deviations.”[3]
Johannes Schult, Nicole Mahler, Benjamin Fauth, and Marlit A. Lindner (2021)	“Did Students Learn Less During the COVID-19 Pandemic? Reading and Mathematics Competencies Before and After the First Pandemic Wave”[9]	Germany	8.5 weeks	Primary (Grade 5)	Reading and math	Significant	80.000 students	“In line with studies from other countries, competence scores were slightly lower in 2020 compared with the three previous years (–0.07 standard deviations for reading comprehension, –0.09 for operations, and –0.03 for numbers).”[9]
Gustaf Bernhard Uno Skar, Steve Graham, and Alan Huebner (2021)	“Learning Loss During the COVID-19 Pandemic and the Impact of Emergency Remote Instruction on First Grade Students’ Writing: A Natural Experiment”[10]	Norway	7 weeks	Primary (Grade 1)	Writing	Significant	2.453 students	“We found that students attending first grade during the pandemic had lower scores for writing quality, handwriting fluency, and attitude toward writing than their first grade peers tested a year earlier before the COVID-19 pandemic emerged. Implications for policy and instruction as well as future research are presented.”[10]
Martin J. Tomasik, Laura A. Helbling, and Urs Moser (2021)	“Educational gains of in-person vs. distance learning in primary and secondary schools: A natural experiment during the COVID-19 pandemic school closures in Switzerland”[13]	Switzerland	8 weeks	Primary (Grade 3-6) Secondary (Grade 7-9)	Math, German	Significant for primary and insignificant for secondary	13.134 primary students and 15.551 secondary students	“While secondary school pupils remain largely unaffected by the school closures in terms of learning gains, for primary school pupils learning slows down and at the same time interindividual variance in learning gains increases.”[13]

As Tabel I detailed, most studies revealed learning loss was being experienced by students around the world. However, this evidence said not all student was experiencing learning loss. For example, Andrew E. Clark et al. revealed that learning loss was insignificant for a secondary student, especially in grade 9[11]. Likewise, Markus Wolfgang Hermann Spitzer et al. found elder grade, in this case, grade 12, was not impacted by learning losses[12]. The same result found by Tomasik et al. said learning loss impacted primary students while in contrast, secondary school students were not significantly impacted[13]. This condition possibly happens because the older student was more independent than the younger student. This is in line with research results of Glen Elder, who found that older children gained terms of autonomy and ability development throughout the great recession, because of the variations in developing cognitive and mental abilities[14].

In contrast, two studies found that students' academic results increased. Andrew E. Clark et al. said students' educational outcomes stepped forward all through the closure of schools[11]. This evidence similar to Markus Wolfgang Hermann Spitzer et al. studies found an increase in students' performance during the closure of schools[12]. During the shutdown of school, students could use online learning. Using of online learning platforms is a big factors in students' performance improvement during pandemics[15][16]. Online learning programs improved learning result of low performers[7] and to be effective environment in preventing learning losses associated school shutdown[12]. Distance learning arrangements appear a good suggests to substitute for in-person learning, at least in emergency scenario[13].

Most studies revealed learning loss was being experienced by students around the world. Carla Haelermans et al., Per Engzell et al., Johannes Schult et al., Gustaf Bernhard Uno Skar et al., and Martin J. Tomasik et al., found inequality of education in primary students[6][3][9][10][13]. Likewise, Çigdem Haser et al., as well as Clare Halloran et al., revealed there was inequality in education for both primary and secondary pupils[7][8].

Some studies revealed the evidence as the factor of inequality in education. For example, Carla Haelermans et al. said the learning loss was affected by parental education[6]. This was in line with Per Engzell et al. studies that losses were larger from low-educated homes[17]. It means that students with low-educated parents barely learned anything during school shutdown[6]. Home learning surroundings became greater crucial when students were faraway from the school[5]. The previous analysis has shown that the home surroundings is very important for progress of reading motivation and literacy skills[18][19]. Carla Haelermans et al. shown that reading skills are less affected by school shutdown. It suggests that the family surroundings has an important role in the progress of reading skills[6]. In line with this finding, some research also suggest that family environment is associate necessary supply of difference in reading skills[18].

Another factor of inequality in education was parental income[6]. This finding was similar to Andre et al. studies that there is a large gap in educational attainment of poorer children and better-off families[5]. This finding support an idea of the Çigdem Haser et al. survey that one of the reason for mathematics learning loss was the socio-economic status of families[7]. This research suggests that there are differences in how students spend their time studying by home background during school closure[5][20][21][22].

In another study, Çigdem Haser et al. found that the learning loss was affected by teachers' practice in the school[7]. The school shutdown forced by pandemic suggest that teachers were not prepared for such condition in terms of online learning skills[23]. Some studies said that the teachers did not have enough internet connection and tools for distance learning[24][25]. Gore et al. said that learning loss impacted students with low-ICSEA schools due to the lower educational advantage attending students[26]. Not being in an exceedingly school surroundings appeared to be one vital reason for mathematics learning loss for children from any sort of school[5].

The research on learning loss needs to be explored again. Consider Covid-19 still threatens the world. More research about learning loss is useful for the government to make a crucial educational policy. For example, research focuses on documents of school reflections about education during the Covid-19 pandemic and the anticipation of the school to reduce the student's learning loss and accelerate the recovery of education.

## 4. Conclusion

The research results of this study were to see the recorded learning losses as the impact of the Covid-19 pandemic school closure. The data documented in the international peer-reviewed journal or conference was associated by using systematic review.

Based on analyzing research results, more than 1 million articles were obtained, and nine studies were screened. Seven of nine articles revealed that learning loss impacted students. Most of the studies said primary students experienced learning loss in various subjects. Several factors of the learning loss were parental education, parental income, teacher's practice in the school and low-ICSEA schools.

Future research is needed that moves to documents of school reflections about education during the Covid-19 pandemic and the school's anticipation to decrease the student's learning loss for accelerating the recovery of education.

## 5. Acknowledgments

The author would like to acknowledge the Lembaga Pengelola Dana Pendidikan (LPDP) for supporting this research and publication funding. Thank you to Universitas Negeri Yogyakarta.

## References

- [1] UNICEF, "COVID:19 Scale of education loss 'nearly insurmountable', warns UNICEF," *UNICEF*, 2022. <https://www.unicef.org/press-releases/covid19-scale-education-loss-nearly-insurmountable-warns-unicef>.
- [2] UNICEF, "COVID-19 'biggest global crisis for children in our 75-year history' – UNICEF," *UNICEF*, 2021. [https://www.unicef.org/indonesia/press-releases/covid-19-biggest-global-crisis-children-our-75-year-history-unicef#\\_ftnref1](https://www.unicef.org/indonesia/press-releases/covid-19-biggest-global-crisis-children-our-75-year-history-unicef#_ftnref1).
- [3] P. Engzell, A. Frey, and M. D. Verhagen, "Learning loss due to school closures during the COVID-19 pandemic," *Proc. Natl. Acad. Sci. U. S. A.*, vol. 118, no. 17, 2021, doi: 10.1073/PNAS.2022376118.
- [4] & R. M. L. Pier, H. J. Hough, M. Christian, N. Bookman, B. Wilkenfeld, "Covid-19 and the educational equity crisis: Evidence on learning loss from the CORE data collaborative," *Policy Analysis for California Education*, 2021. <https://edpolicyinca.org/newsroom/covid-19-and-educational-equity-crisis>.
- [5] M. C. D. Alison Andrew, Sarah Cattan, A. P. Christine Farquharson, Lucy Kraftman, Sonya Krutikova, and A. Sevilla, "Fiscal Studies - 2020 - Andrew - Inequalities in Children s Experiences of Home Learning during the COVID- 19 Lockdown in.pdf." *Fiscal Studies*, 2020.
- [6] C. Haelermans *et al.*, *Sharp increase in inequality in education in times of the COVID-19-pandemic*, vol. 17, no. 2 February. 2022. <https://doi.org/10.1371/journal.pone.0261114>
- [7] Ç. Haser, O. Doğan, and G. Kurt Erhan, "Tracing students' mathematics learning loss during school closures in teachers' self-reported practices," *Int. J. Educ. Dev.*, vol. 88, no. December 2021, pp. 0–2, 2022, doi: 10.1016/j.ijedudev.2021.102536.
- [8] C. Halloran, R. Jack, J. C. Okun, and E. Oster, "Pandemic Schooling Mode And Student Test Scores: Evidence From Us States," *NBER Work. Pap.*, pp. 1–28, 2021. <https://doi.org/10.3386/w29497>
- [9] J. Schult, N. Mahler, B. Fauth, and M. A. Lindner, *Did students learn less during the COVID-19 pandemic? Reading and mathematics competencies before and after the first pandemic wave.* 2022. <https://doi.org/10.31234/osf.io/pqtgf>

- [10] G. Bernhard *et al.*, “Journal of Educational Psychology Learning Loss During the COVID-19 Pandemic and the Impact of Emergency Remote Instruction on First Grade Students ’ Writing : A Natural Experiment Learning Loss During the COVID-19 Pandemic and the Impact of Emergency Rem,” *J. Educ. Psychol.*, 2021, doi: <http://dx.doi.org/10.1037/edu0000701>.
- [11] A. E. Clark, H. Nong, H. Zhu, and R. Zhu, “China Economic Review Compensating for academic loss : Online learning and student performance during the COVID-19 pandemic ☆,” *China Econ. Rev.*, vol. 68, no. April, p. 101629, 2021, doi: 10.1016/j.chieco.2021.101629.
- [12] M. W. H. Spitzer and S. Musslick, “Academic performance of K-12 students in an online-learning environment for mathematics increased during the shutdown of schools in wake of the COVID-19 pandemic,” *PLoS One*, vol. 16, no. 8 August, pp. 1–16, 2021, doi: 10.1371/journal.pone.0255629.
- [13] M. J. Tomasik, L. A. Helbling, and U. Moser, “Educational gains of in-person vs. distance learning in primary and secondary schools: A natural experiment during the COVID-19 pandemic school closures in Switzerland,” *Int. J. Psychol.*, vol. 56, no. 4, pp. 566–576, 2021, doi: 10.1002/ijop.12728.
- [14] J. & A. C. Glen H. Elder, “Economic Stress in Lives : Developmental Perspectives,” vol. 44, no. 4, pp. 25–45, 1988. <https://doi.org/10.1111/j.1540-4560.1988.tb02090.x>
- [15] S. J. Jez and R. W. Wassmer, “The Impact of Learning Time on Academic Achievement,” *Educ. Urban Soc.*, vol. 47, no. 3, pp. 284–306, 2015, doi: 10.1177/0013124513495275.
- [16] L. Eskreis-Winkler, E. P. Shulman, V. Young, E. Tsukayama, S. M. Brunwasser, and A. L. Duckworth, “Using wise interventions to motivate deliberate practice,” *J. Pers. Soc. Psychol.*, vol. 111, no. 5, pp. 728–744, 2016, doi: 10.1037/pspp0000074.
- [17] P. Engzell, A. Frey, and M. Verhagen, “Pre-analysis plan for: Learning inequality during the COVID-19 pandemic,” *Open Sci. Framew.*, pp. 1–16, 2020.
- [18] R. van Steensel, N. McElvany, J. Kurvers, and S. Herppich, “How effective are family literacy programs? results of a meta-analysis,” *Rev. Educ. Res.*, vol. 81, no. 1, pp. 69–96, 2011, doi: 10.3102/0034654310388819.
- [19] C. Villiger, A. Niggli, C. Wandeler, and S. Kutzelnann, “Does family make a difference? Mid-term effects of a school/home-based intervention program to enhance reading motivation,” *Learn. Instr.*, vol. 22, no. 2, pp. 79–91, 2012, doi: 10.1016/j.learninstruc.2011.07.001.
- [20] C. Bansak and M. Starr, “Covid-19 shocks to education supply : how 200 , 000 U . S . households dealt with the sudden shift to distance learning,” *Rev. Econ. Househ.*, pp. 63–90, 2021, doi: 10.1007/s11150-020-09540-9.
- [21] H. Dietrich, A. Patzina, A. Lerche, and A. Lerche, “Social inequality in the homeschooling efforts of German high school students during a school closing period,” 2021, doi: 10.1080/14616696.2020.1826556.
- [22] D. Reimer, E. Smith, I. G. Andersen, and B. Sortkær, “Research in Social Stratification and Mobility What happens when schools shut down ? Investigating inequality in students ’ reading behavior during Covid-19 in Denmark,” *Res. Soc. Stratif. Mobil.*, vol. 71, no. November 2020, p. 100568, 2021, doi: 10.1016/j.rssm.2020.100568.
- [23] K. V. Middleton, “Educational Measurement - 2020 - Middleton - The Longer-Term Impact of COVID-19 on K 12 Student Learning and Assessment.pdf.” Educational Measurement, 2020. <https://doi.org/10.1111/emip.12368>
- [24] L. Wardle, *Teachers ’ wellbeing and workload during Covid-19 lockdown Beng Huat See*, vol. 44, no. June. 2020.
- [25] S. Barrett, “Emergency Distance Learning during the COVID-19 Pandemic : Teachers ’ Perspectives Final Report ( March 2021 ),” no. March, 2021.
- [26] J. Gore, L. Fray, A. Miller, J. Harris, and W. Taggart, *The impact of COVID-19 on student learning in New South Wales primary schools: an empirical study*, vol. 48, no. 4. 2021 <https://doi.org/10.1007/s13384-021-00436-w>