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Associations Between Lower Secondary Students' Mathematics Performance and Remote Learning Experiences During the Covid 19 Pandemic

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Introduction

- Covid-19 pandemic → the rapid introduction of remote learning.
- The aim of this paper:
to identify which forms of support and which resources promoted students' learning outcomes, as well as which problems were particularly significant.
- The data source:
information on Latvian students from the OECD PISA 2022 database
(5373 students from 225 schools).

Methods

Indicators characterizing remote learning and their association with academic achievement

- Principal component analysis – 5 scales
- Linear regression model – their association with students' mathematics performance

Comparative analysis of remote learning organization: top and bottom 10% of schools

Each questionnaire item was analyzed separately to determine whether the responses of students in high- and low-achieving schools differed statistically significantly.



Indicators characterizing remote learning and their association with academic achievement

- 5 scales:

- Teachers' psychological support,
- Provision of learning materials by teachers,
- Availability of learning resources,
- Students' psychological problems
- Students' physical problems.

Students' mathematics performance



Comparative analysis of remote learning organization: top and bottom 10% of schools

22 schools in each group:

- High achievement group (HA, top 10%) – 625 students,
- Low achievement group (LA, bottom 10%) – 274 students

School type	LA group	HA group
Basic schools	17	2
Secondary schools	5	7
State gymnasiums	0	13

School location	LA group	HA group
Rīga	0	12
State cities	5	3
Cities	2	6
Rural areas	15	1



Teachers' activities

More in High Achievement schools:

- Teachers offered **live virtual classes** on a video communication program ($\Delta = 22$)
- Teachers sent **assignments** ($\Delta = 20$)
- Teachers **uploaded material** on a learning management system or school learning platform ($\Delta = 20$)
- Teacher **asked to submit** completed school assignments ($\Delta = 17$)
- Teachers **sent learning materials** to study independently ($\Delta = 16$)



Learning resources

More in High Achievement schools:

- **Real time lessons** by a teacher from their school on a video communication program ($\Delta = 22$)
- **Recorded lessons or other digital material** from other sources (e.g. Uzdevumi.lv, Māconis, Soma.lv, Tavaklase.lv) ($\Delta = 19$)
- **Digital** textbooks, workbooks, or worksheets ($\Delta = 18$)

More in Low Achievement schools:

- **Lessons broadcast** over television or radio ($\Delta = -24$)



Problems

Less in High Achievement schools:

- Problems with **access to school supplies** (e.g. paper, pencil) ($\Delta = 10$)
- Problems with finding **a quiet place to study** ($\Delta = 7$)

Less in Low Achievement schools:

- Problems with **motivating myself** to do school work ($\Delta = -12$)
- Problems with **understanding** my school assignments ($\Delta = -7$)



Family support

More in Low Achievement schools:

- Taught **additional topics** not part of school assignments ($\Delta = -18$)
- **Explained** new content ($\Delta = -13$)

Self-assessment of learning

Students from both groups report, that **learned less** in remote learning than in school (60% LA; 66% HA).



Students' feelings

More in High Achievement schools:

- My teachers were **available** when I needed help (e.g. through virtual office hours, email, chat). ($\Delta = 14$)
- I **improved my skills** in using digital devices for learning purposes. ($\Delta = 13$)
- I felt **lonely**. ($\Delta = 11$)

More in Low Achievement schools:

- My teachers were **well prepared** to provide instruction remotely. ($\Delta = -18$)
- I **fell behind** in my school work. ($\Delta = -11$)



Students' confidence in their ability to learn in potential future remote learning

More in High Achievement schools:

- Using a learning management system or **school learning platform** (e.g. Moodle®, Google®ClassroomTM, Mykoob, E-klase, Uzdevumi.lv) ($\Delta = 29$)
- Using **a video communication program** (e.g. ZoomTM, Google® MeetTM, Microsoft® Teams, SkypeTM, WebexTM, Jitsi) ($\Delta = 28$)
- **Finding** learning resources online on my own. ($\Delta = 16$)
- **Assessing** my progress with learning. ($\Delta = 10$)



During the time when your school building was closed because of COVID-19, which of the following digital devices did you use most often for your school work?	LA, %	HA, %
My own laptop, desktop computer, or tablet	57	82
My own smartphone	28	13
A digital device that was also used by other family members	5	4
A digital device that my school gave or lent to me	8	2
I did not have any digital device for my schoolwork.	3	0



Conclusion

In **high achievement** schools:

- more structured learning process,
- digital resources and tools,
- better digital competence,
- more lonely,
- harder tasks and more motivation problems.

In **low achievement** schools:

- more TV/radio broadcasted lessons,
- less access to school supplies and a quiet place to study,
- more help needed to learn,
- limited access to adequate digital learning resources.



Thank you!



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