

# DATA OF STUDENTS' SKILLS AND ACADEMIC ACHIEVEMENT ASSESSED DURING COVID-19 INDICATE RISKS FOR INEQUALITY

Liena Hačatrjana

University of Latvia, Latvia

## ABSTRACT

International research reports have indicated inequality risks for students' future success due to COVID-19 pandemic, including risk of dropping out of school and risk of learning losses. Group differences in students' skills and opportunities have been revealed way before pandemic, and the pandemic itself can contribute as a facilitating factor for the increase of these differences. In this research 952 students in the 9<sup>th</sup> grade were assessed during distance learning in Latvia. Data were analysed regarding group differences, as well as students' decisions about continuing education after the primary school. Results show that: 1) Students who had participated in individual face-to-face consultations showed lower verbal and nonverbal reasoning skills, lower grades in four previous study semesters, and had parents with lower education compared to students who had not participated in individual consultations, indicating the importance for such individual support mechanisms for the students facing difficulties; 2) Students with lower parental education level had lower average grades in four previous semesters, lower verbal reasoning and nonverbal reasoning abilities, self-management and problem-solving skills; 3) Girls had higher average grades in all four consecutive semesters and higher problem-solving and self-management skills, compared to boys; 4) Pandemic affected students' decisions about continuing studies after the 9<sup>th</sup> grade mostly for those students who had thought about changing the school or the location of school.

**Keywords:** *distance learning, inequality, continuing education, skills, grades, gender*

## Introduction

Soon after the global COVID-19 pandemic started several reports were issued that warned about potential learning losses, inequality risks and even risks of dropping out of school for the vulnerable groups of students (e. g., Azevedo et al., 2020; Kaffenberger, 2021). The pandemic and distance learning might have increased the differences that students had already had before it and might have influenced students' decisions about continuing education. According to UNICEF report (UNICEF Office

of Research, 2018) typical reasons for inequality in education are socio-economic aspects, including parental education, place of living and the school, gender disbalances, and also individual abilities, such as cognitive abilities. Previous research confirms group differences regarding parental education, individual abilities and other factors, such as gender (Duckworth & Seligman, 2006; Goulas and Megalokonomou, 2020; Idris et al., 2020; Kampa et al., 2021). Difficulties in these various domains may further increase risks of worse life outcomes, such as poorer education and work options. Research also highlights the factors that are associated to dropping out of school: both socioeconomic factors, individual factors, as well as effectiveness of teaching methodologies (Barragán-Moreno & Lozano-Galindo, 2022).

Research on educational and psychological aspects during the pandemic has been focused on various aspects, such as students' individual attitudes, well-being and academic outcomes (e. g., Hacatrjana, 2022; Scott et al., 2021), as well as risks of not returning to schools after the pandemic (UNESCO, 2020), and these results indicate that there were variations in how students and education systems (Barron Rodriguez et al., 2021; Lindblad et al., 2021; Morgan, 2022) dealt with distance learning. For some students it was easier to deal with distance learning than for others (Hacatrjana, 2021a). Data on experiences of distance learning situation at the very beginning of the pandemic in Latvia showed that in general the satisfaction with the education process was acceptable, in the meantime also indicating several challenges for all included parties (e. g., difficulties to learn independently for the students or lack of felt support) (Ministry of Education and Science of Latvia, 2020). In Latvia, students generally have rated their available technologies as sufficient to carry out distance learning (Hacatrjana, 2021a), but it must be noted that they were using various devices for studying, including laptops, tablet computers and even smartphones, which also had to be shared with other family members that might have affected the effectiveness of studying and their attitude to study. To conclude, it is important to further investigate how the experiences during the pandemic affected students' decisions about continuing their education and thus maintaining further opportunities for studying and getting better jobs in the future.

As mentioned before, distance learning might have left a larger influence on some groups of students, compared to others. For students in the final grades of basic or secondary education (9<sup>th</sup> or 12<sup>th</sup> grades in Latvia, respectively) the situation was particularly intense because they usually had to take the state exams at this stage of education. However, due to the pandemic there were changes in how these exams were organized, for example, in the spring of 2021 the usual exams after the 9th grade

were replaced with “diagnostic tests” in the same subjects (mandatory for Mathematics and Latvian, optional for other subjects) (Cabinet of Ministers Republic of Latvia, 2021). It is important to note that in Latvia’s education system students finish basic (also called “primary”) school at the end of the 9<sup>th</sup> grade (Cabinet of Ministers Republic of Latvia, 1998). They can then choose further options for studying, for example, at general education secondary schools (also called “high-schools”), gymnasiums with at least two profiles of specialization (e. g., focusing on humanities or exact sciences), and vocational schools with an option to also learn a profession. Choosing the most appropriate track or type of school is important at this stage of students’ life as it may affect their further work or study opportunities. Also, to be omitted to gymnasiums or other schools, students often have to take extra entrance exams, thus showing their skills, motivation and persistence. That is the reason why the end of the 9<sup>th</sup> grade can be viewed as a turning point for some students and is overall an important stage in students’ lives, therefore it is especially important to study experiences of these students.

Based on the previously mentioned factors that relate to inequality risks in education (UNICEF Office of Research, 2018), the current research included the assessments of students’ skills and cognitive abilities, grades, parental education level and other aspects that could potentially indicate differences, and assessments of the experiences of students that may have led to changes in decisions about continuing school. The current research focuses on finding inequality risks of students based on their assessment and exploring how the pandemic affected students’ decisions about continuing education. Thus, the two main research questions are: 1) What are the group differences found in the data of students that may indicate risks for further inequality? 2) How were students’ decisions and attitudes about continuing school after the 9<sup>th</sup> grade affected by the pandemic?

## Methodology

### Sample

Students in the 9<sup>th</sup> grade (at the end of school year 2020/2021) participated in the study,  $n = 952$ , 502 girls and 435 boys (several participants had not indicated gender or age), aged from 14 to 17 years ( $M = 15.38$ ;  $SD = 0.54$ ), from various public schools in all regions in Latvia.

### Materials

1. *Problem-solving skills* were evaluated with a self-assessment questionnaire with 10 items on two scales: 1) Solution development and evaluation (6 items) and 2) Flexibility to change solution (4 items), originally

showing internal consistency of respectively  $\alpha = 0.79$  and  $\alpha = 0.71$  (Hacatrjana, 2021b). Each item had to be rated on a scale from “Never” to “Always” (0 to 5 points) based on how often the student performed the mentioned activity (item examples: “When solving a situation or doing a task, I change my solution if I understand that it is not appropriate”, “When I have finished a task, I think about what worked well and what didn’t.”).

2. *Self-management questionnaire* was used to assess students’ skills to organize themselves and their daily learning. It consists of six items (for example, “I write down all the tasks in a certain place”), that originally showed good internal consistency of  $\alpha = 0.77$ . Each item had to be rated on a scale from “Never” to “Always” (0 to 5 points) (Hacatrjana, 2021b).
3. *Nonverbal reasoning abilities* were measured with a short version (10 items) of Sandia Matrices test (see Harris et al., 2020) using figural matrices tasks where the individual has to understand the patterns existing in a set of figures and choose what kind of symbol continues the pattern, internal consistency was  $\alpha = 0.72$ .
4. *Verbal reasoning abilities* were measured with a short verbal analogies test (10 items) (Kretzschmar, Hacatrjana and Rascevska, 2017). In the test one pair of words and the first word of the second pair is given (for example, “snow – to ski” and “ice – ...”) and the participant must understand the relation between the first pair to give an answer to the second pair. Internal consistency of the test was  $\alpha = 0.81$ .
5. *Academic achievement* was measured by gathering the average grades of students in the last four semesters (autumn 2019 to spring 2021). Thus, it was possible to analyse the grades longitudinally in retrospective, including the period before the pandemic to serve as a baseline measurement. Grades can vary from 1 to 10 (maximum grade) in Latvia.
6. Several additional questions were asked about the subjective experience during distance learning: a) to rate their perceived difficulty to deal with the distance learning situation, b) to rate if the technological means available to them were sufficient for studying remotely, c) to answer if they had been to an individual consultation with a teacher to tackle their difficulties.
7. Demographic questions were asked to students: gender, age, the language they mostly spoke at home, the level of parental education (from “1-Finished primary school” to “6-Doctoral degree”).
8. To gather students’ attitudes and experiences about how distance learning and pandemic affected their decisions about their further studies after the primary school a) an open-ended question was asked about their decisions and b) they were asked to retrospectively indicate

quantitatively to what extent they had decided to continue their education further after the primary school a year ago and at the time of the assessment.

### Procedure

Data was collected directly from students (with questionnaires) and from the schools (by gathering average grades of students). Students completed all the questionnaires online using testing platform [www.explorol.lv](http://www.explorol.lv) during a specially organized online lesson for each class. All data were collected in an anonymized form using an individual code for each student. At the beginning of the project an informative letter was sent to parents to allow or disallow their child's participation in the study.

### Results

The first aim of the study was to look for group differences that might indicate inequality risks. The second aim was to assess how the pandemic and distance learning was related to students' decisions about their further education after the 9<sup>th</sup> grade. Both quantitative and qualitative analysis methods were used to analyse the data. First, the analysis of group differences is presented.

#### Group differences in the data of students indicating risks of inequality

First, descriptive statistics were calculated for the indicators measured in the study (see Table 1). In addition, Kolmogorov-Smirnov indicator showed that distribution was not normal for any of the measurements ( $p < 0.05$ ).

**Table 1.** Descriptive statistics of the measured indicators

	<b>N</b>	<b>Min</b>	<b>Max</b>	<b>M</b>	<b>SD</b>
Education level of parents	908	1.00	6.00	3.39	1.23
I have felt difficulties to deal with studies during distance learning	952	0.00	5.00	3.01	1.29
Technologies available to me are sufficient to study remotely	952	0.00	5.00	4.30	1.00
Nonverbal reasoning	764	0.00	10.00	4.76	2.65
Verbal reasoning	868	0.00	10.00	5.34	2.92
Self-management	931	1.00	30.00	16.38	6.07
Solution development and evaluation (problem solving)	937	0.00	30.00	15.08	5.13
Flexibility to change solution (problem solving)	937	0.00	20.00	12.69	3.45

Further, differences between groups were assessed between students who had participated in an individual consultation or had not participated in one, using the Mann-Whitney criterion (see Table 2). Participation in such consultations indicates that a student had accumulated difficulties in dealing with study tasks and applied for extra help.

**Table 2.** Differences between students who had participated or had not participated in individual consultations

	Students who did not attend consultations		Students who attended consultations		<i>U</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Education level of parents	3.46	1.23	3.17	1.19	67057.00**
I have felt difficulties to deal with studies during distance learning	2.97	1.31	3.11	1.23	80441.00
Technologies available to me are sufficient to study remotely	4.30	1.00	4.32	1.01	83603.00
Nonverbal reasoning	4.95	2.59	4.12	2.76	42579.00**
Verbal reasoning	5.52	2.87	4.78	3.00	59945.50**
Self-management	16.38	6.09	16.37	6.04	80342.50
Solution development and evaluation (problem solving)	14.91	5.14	15.59	5.09	75224.00
Flexibility to change solution (problem solving)	12.78	3.47	12.42	3.40	76923.50

\*\* $p < 0.01$

As it can be seen in Table 2 results show that students who had participated in individual face-to-face consultations showed lower verbal reasoning skills and nonverbal reasoning skills, had parents with lower education compared to students who had not participated in an individual consultation. In addition, they had statistically significantly lower mean grades in all four previous study semesters (based on a mean score calculated from grades in Latvian, Mathematics and English) ( $U = 25265.50$  to  $U = 28186.50$ ,  $p < 0.01$  in all cases).

Next, to assess the group differences, based on parental education level, Spearman correlation coefficients were analysed. Results show that parental education level is significantly related to nonverbal reasoning ( $r =$

0.16,  $p < 0.01$ ), verbal reasoning ( $r = 0.17$ ,  $p < 0.01$ ), self-management ( $r = 0.07$ ,  $p < 0.05$ ), solution development and evaluation ( $r = 0.09$ ,  $p < 0.01$ ), flexibility to change the solution ( $r = 0.21$ ,  $p < 0.01$ ), and mean grades in four previous study semesters ( $r = 0.32$  to  $r = 0.35$ ,  $p < 0.01$ ). It shows negative correlation to student's subjectively felt difficulties during distance learning ( $r = -0.10$ ,  $p < 0.01$ ).

Next, gender differences were calculated using Mann-Witney test and it shows that girls had higher results in verbal reasoning ( $U = 84654.00$ ,  $p < 0.01$ ), self-management ( $U = 83398.00$ ,  $p < 0.01$ ), solution development ( $U = 96078.50$ ,  $p < 0.01$ ), flexibility to change the solution ( $U = 88177.00$ ,  $p < 0.01$ ) and higher grades in all four previous semesters (the highest  $U = 37752.50$ ,  $p < 0.01$ ), however also reporting higher felt difficulties during distance learning ( $U = 90194.00$ ,  $p < 0.01$ ) when compared to boys.

### **Decisions about continuing education during the pandemic**

Next, the second aim of the study was to explore how students' decisions about continuing education after the 9<sup>th</sup> grade in a traditional face-to-face high school were affected by the pandemic. Both quantitative and qualitative analysis methods were used to answer this research question.

The students' ratings about the extent to which they had thought about continuing to study further at high-school retrospectively one year ago (2020) and at the time of assessment (2021) were compared. Based on Wilcoxon test, students' confidence about continuing studies had dropped ( $Z = -3.12$ ,  $p = 0.01$ ;  $M = 2.08$ ;  $SD = 0.89$  "a year ago" and  $M = 2.00$ ;  $SD = 0.98$  in 2021). The difference is not large, but it is statistically significant.

Further, qualitative analysis is presented regarding students' experiences and thoughts about continuing school. Content analysis was used to examine how the decisions about further education and continuing their education were affected by the pandemic, based on the views of students themselves and their statements of their unique experience (Shannon & Hsieh, 2005). The initial analysis indicated that the answers express three various views of experience and then they were coded according to these three types of experiences reflected in the students' statements: 1) decisions about studying further were not affected; 2) decisions were slightly affected (or the situation gave some thoughts about ways of learning in general); 3) decisions were highly affected. Several answers were coded as not having the necessary information to conclude about the particular research question. Further these types of students' experiences are presented in detail.

### **Decisions about further education were not affected by the pandemic**

For some students the distance learning and the pandemic did not change anything in their decisions about future education, based on their own self-reflection. It must be noted that a part of students that have stated that their decisions were not changed by the pandemic, had also written that they had previously not even considered studying in another school.

*I still think of going to traditional high school (with face-to-face learning) after the 9th grade.*

*I had already decided that after primary school I would continue my studies in high school, and I had not changed my decision. I think that in high school we will be able to study in face-to-face again.*

*My opinion has not changed. I see more benefits from face-to-face training. First, socialization. Also, in the future I think to work in the workplace with people (where communication is required). Secondly, the opportunity to communicate with teachers immediately (instead of waiting for an answer to a written question).*

### **Decisions about future studies were slightly affected or the experience had initiated thoughts about learning in general**

For another part of the students the distance learning experience gave some thoughts and conclusions about the most appropriate way to study in general. Their ideas about future were either affected to some extent or the pandemic made them rethink or doubt their ideas about future, but not majorly changing their decisions. There is a polarity in the experience of students, as some students realized that distance learning is not suitable for them, or they realized how important and crucial face-to-face learning and socializing is. Whereas some students enjoyed the benefits of studying individually at home and can envision this as their future.

*Although I am already used to studying distantly, I realize that I can learn a lot of more in person. In the future, I really want to study in face-to-face settings.*

*I liked distance learning because I can concentrate better to work, there is no noise. I would like to continue to study remotely.*

*I realized that I needed to plan more and motivate myself to study distantly, but I still want to go to a distance school to be able to work in parallel.*

*I would like to connect my life with a job where I could work remotely.*

### **Decisions about further education were highly affected by the pandemic**

Some of the students had noted that distance learning and the pandemic itself majorly affected their thoughts and decisions about their future and



their willingness to change the school or to travel to another city during the pandemic. Also, the option to choose vocational education was affected as practical workshops in schools were limited.

*Due to the pandemic, I am much less motivated to continue studying. I have always wanted to go to school with an arts track, but I did not have the opportunity to go to preparation courses, so this goal now seems impossible. There is less and less hope that I will study where I wanted. I used to plan to continue my studies in high school in Riga [the capital of Latvia], but after the pandemic and distance learning I decided that I would stay in my current school.*

We can conclude that not all students felt that their decisions had been affected by the pandemic. Mostly, the situation was hard for those students who had previously thought about changing school, for example, going to a larger city or to a school with a specific track. On the contrary, the decisions were less affected for those who had not thought about changing school or going to another city.

## Discussion

Due to COVID-19 pandemic many students worldwide experienced disruptions in their education, bringing new challenges to deal with, and also increasing inequality among different groups of students and options available to them (Azevedo et al., 2020, Kaffenberger, 2021). The pandemic highlighted vast differences in students' opportunities provided by parents and schools (e. g., Goulas and Megalokonomou, 2020), and affected their motivation. The current research had two main aims: 1) to explore group differences in 9<sup>th</sup> grade students' skills and attitudes that indicate risks for inequality, and 2) to assess whether students' decisions about continuing their education were affected by the pandemic based on their own reports.

In respect to the first aim, results clearly indicate that there are major group differences found in the current sample of students from Latvia. For example, there are significant gender differences in the grades in all semesters, favouring girls. Girls also scored higher on self-management and problem-solving assessments indicating a more self-organized and systematic approach to learning individually, that is in line with previous research about girls' grades and self-discipline (e. g., Duckworth & Seligman, 2006), and other skills, for example, collaborative problem-solving (OECD, 2017). This may be one of the reasons of lower male proportion later in higher education (CSB, 2021).

During distance learning period it was allowed for students in Latvia to have individual consultations if they were facing difficulties with learning. Results show that students who had participated in individual face-to-face

consultations showed lower verbal reasoning skills and nonverbal reasoning skills, had parents with lower education compared to students who had not participated in an individual consultation, also they had statistically significantly lower mean grades in all four previous study semesters. The results show that these students had struggled even before the pandemic. Altogether this indicates the importance for such individual support mechanisms for the students in need even in the hard times and distance learning because they clearly performed lower compared to those that did not attend consultations. However, it was interesting that students' self-reported level for available technical means to carry out distance learning was not significantly different, similarly to the results self-assessment measurements of self-management and problem-solving skills. Altogether, the current results confirm previously established role that cognitive abilities play regarding academic achievement (e. g., Hacatrjana, 2022; Kampa et al., 2021). Not tackling the challenges some students have with learning early enough may lead to even larger discrepancies and the students might find it harder to grasp increasingly complex curriculum, leading to risks of dropping out of school. These results support the need for individual support mechanisms that are timely enough to avoid further inequality.

The current research results are also in line with previous research on the importance of the parental education level – another factor that may lead to lack of support, lack of seeing education as valuable for their children, and lack of extra learning opportunities offered to children (e. g., Barron Rodriguez et al., 2021; Delès, 2021; Goulas and Megalokonomou, 2020; Idris, Hussain and Nasir, 2020). This all inevitably may lead to inequality that is based on the child family's socio-economic circumstances. The combination of these aspects – individual abilities of the child and parental factors – is crucial for an effective development of the child's skills (Flores-Mendoza et al., 2021). Lower skills, grades and the felt support leads to lower confidence about their skills and lower motivation to pursue higher educational goals.

In respect to the second aim of the study, it was confirmed statistically that students reported they were less likely to continue learning in a traditional (face-to-face) high school compared to their retrospective thoughts before the pandemic, though the difference was relatively not large, indicating that there was probably a minor portion of students who had considered either other options for education (e. g., distance education) or not continuing it at all. Based on previously issued calculations, Europe countries were not among those with the highest risks for students not to return to school (UNESCO, 2020), altogether giving a promising picture of the situation on Latvia. However, the qualitative analysis of students' statements gives a deeper insight into this issue, showing that the situations and attitudes

varied significantly among students with different aspirations. Generally, it can be concluded that opposing views appear in the answers: a part of students found it easy to learn independently at their own pace at home and they had not experienced major problems with their further plans for studying. Sometimes these plans had been just to continue to study at the same district school and not to change school at all, thus, to keep the *status quo*. But for the other part of the students the distance learning and general restrictions brought significant challenges, for example, they were not able to attend special courses to prepare for a specific entrance exam at a specific gymnasium, or they did not want to go to live and study in another city because of the sense of unsafety during the pandemic. This indicates inequality risks towards students from rural areas or smaller cities. Interestingly, a part of students that have stated that their decisions were not changed by the pandemic, had also written that they had not even considered studying anywhere else after finishing basic school. It confirms that for a large part of students it is typical to stay at the same school after the 9<sup>th</sup> grade, often without having to take any entrance exams to get into another school. To conclude, students' personal statements provide a crucial insight into the various experiences of students and about how these experiences formed their decisions about continuing their education after the 9<sup>th</sup> grade and about learning in general.

This research has several limitations. First, it must be noted that self-assessment and retrospective report approach was used for several of the measurements (for example, students had to remember what their opinions about continuing school were a year ago). However, assessment tests were also used, for example, to assess cognitive abilities. In addition, students' grades were gathered in cooperation with schools, thus providing precise data about their academic achievement. Therefore, the researcher tackled the possible issue of validity. Results showed significant differences based on the attendance of individual consultations, however, schools had various approaches to organizing these consultations, so it has to be considered when analysing the results. It is clear that researchers have to continue monitoring students' skills, academic achievement, among other important aspects, to provide science-based conclusions to schools and policy-makers on how to deal with the consequences of the COVID-19 pandemic and distance learning and how to tackle the possible inequalities for students.

## Conclusions

The current research shows risks for inequality of students that may leave further consequences in their lives, especially for students with lower parental education and with accumulated difficulties in studying (e. g., lower

grades already before the pandemic and in the previous semesters). Study also revealed gender differences showing higher results for girls that might be explained by self-discipline. Pandemic brought difficulties in learning for some groups of students, and there are risks of discontinuing education as a result. It can be concluded that a part of students needed individual extra support because of difficulties to deal with learning, therefore individual support mechanisms are crucial during such crisis. Students' decisions about their future and continuing school were also affected, and these decisions might have a further effect on their future, for example, if a talented student decided not to go to a specific school to another city because of fear of unsafety. A part of the students tended to stick to the schools where they had already been learning and not to change them. Schools and the education system in general must be flexible in such crisis not to lose talented students, especially from rural areas. This also applies to vocational schools as for some students it might be very important to learn professional skills, but the learning had been disrupted in the pandemic.

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