

Article

Assessment of the Impact of Distance Education on Students' IQ

Vaidas Gaidelys ^{1,*} , Gintautas Cibulskas ², Rūta Čiutienė ¹, Skaidrius Miliauskas ³ and Evelina Gaideliene ⁴¹ School of Economics and Business, Kaunas University of Technology, 44249 Kaunas, Lithuania² Faculty of Social Sciences, Arts and Humanities, Kaunas University of Technology, 44249 Kaunas, Lithuania³ Department of Pulmonology, Lithuanian University of Health Sciences, 44307 Kaunas, Lithuania⁴ Richelie, 44172 Kaunas, Lithuania

* Correspondence: vaidas.gaidelys@ktu.lt

Abstract: This study analyzed the widespread distance teaching/learning impact in the context of the COVID-19 pandemic and assessed distance teaching/learning's effects on students' intelligence. The distance teaching/learning impact results were evaluated based on the extensive sample tests conducted by applying the Wechsler Abbreviated Scale of Intelligence (WASI) methodology. The tests conducted in January–September 2022 were compared with those conducted in the same age groups in 2017, 2018, 2019, and 2021. The research data were processed in the following three stages: Stage I. Overview of the general situation of the research data concerning the variables. The descriptive statistics method was applied when calculating the percentages representing the students' verbal, non-verbal, and general IQ. Stage II. Estimation of the statistically significant differences between the independent variables. Stage III. Review of the research data. The descriptive statistics method was applied, and the WASI methodology was used to assess the effects of distance teaching/learning on the IQ of 1–12-grade students in the 2017–2019 and 2021–2022 periods. The test sample size was over 2000 respondents who engaged in the study questionnaires and surveys. The effects of distance teaching/learning were assessed in many relevant aspects to identify which factors considerably impacted students' intelligence during distance teaching/learning. Also, a more extensive analysis of these factors was performed to reveal which of them, during the period of distance teaching/learning, (1) greatly influenced students' verbal IQ, (2) significantly impacted students' non-verbal IQ, and (3) had a substantial impact on students' general IQ. The results of the 2021 tests, conducted after the announcement of the official end of distance teaching/learning due to the pandemic, showed that distance teaching/learning affected students' IQ positively. Such results can be associated with an increased number of self-study independent tasks, which in turn influenced the growth of creativity. The IQ tests of students born in 2009 revealed that the total IQ of test participants gradually decreased in 2018, 2019, 2021, and 2022 respectively. These results might have been influenced by the then-prevalent education system, favoring educational programs that do not promote IQ development. It is believed that the parents of children born in Lithuania in 2009 were provided more favorable conditions for raising children than the EU standards. Notably, the IQ of students of aged 6–15 tended to grow from 2017 to 2021, but in 2022, a dramatic drop was observed. The restricted socialization and deficiency of live communication could pose one of the primary reasons for the drop in their IQ. The analysis also showed that distance teaching/learning negatively affected all student groups by age. Age groups differed to a positive and negative extent; e.g., during the research, the most considerable negative effect in the student group aged 6–10 years and the uniqueness of students born in 2009, i.e., the overall highest average IQ of students born that year (134 in 2018), were noticed. However, during the five years afterward, students' IQs decreased (119 in 2022). The analysis of the socio-economic environment allowed for determining a positive trend that could have been influenced by the most favorable program for families established by the government at that time. Furthermore, the study concluded that distance learning had an apparent adverse effect on the IQ of individuals in the 6–19 age group.

Keywords: WASI methodology; distance teaching/learning; verbal; non-verbal; general IQ; socio-economic situation; country's economic growth



Citation: Gaidelys, V.; Cibulskas, G.; Čiutienė, R.; Miliauskas, S.; Gaideliene, E. Assessment of the Impact of Distance Education on Students' IQ. *Educ. Sci.* **2023**, *13*, 359. <https://doi.org/10.3390/educsci13040359>

Academic Editor: James Albright

Received: 7 March 2023

Revised: 19 March 2023

Accepted: 20 March 2023

Published: 30 March 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Previous scientific studies proved that implementing measures to manage the COVID-19 pandemic and organize students' general education remotely, initiated by national governments, resulted in long-term distance (remote) teaching/learning, imposing negative side effects. Consequently, students' psychological states deteriorated, expressed by aggressive behavior, depressive moods, despair caused by lowering academic assessments, etc., which could have had a direct negative impact on students' IQ.

The primary purpose of one study was to evaluate the changes in emotional intelligence assessment (EIA) scores obtained by pharmacy students in a voluntary leadership development program after the COVID-19 pandemic. The participants in 2021 (the pandemic group) completed self-assessment reports before the start of the leadership program in August 2019 (before the pandemic) and at the end of this program in July 2020. They also provided an accompanying self-reflection. The score differences in the pandemic group were compared to the general results achieved by the respondents in previous programs (2017–2019) to identify changes in the students' emotional intelligence, potentially attributable to the COVID-19 pandemic. The issues prevailing in the self-reflection reports were also considered [1].

This research aimed to identify which factors significantly impacted students' intelligence during the officially announced period of distance teaching/learning.

The research hypothesis was that distance learning had a negative effect on students' IQ.

The research objectives were to reveal the factors that had a considerable effect on students' verbal, non-verbal, and overall general IQ.

The research relevance. One study investigated the pandemic group of thirty-five student leaders, while 166 students were included in the control group. The proportion of students with final grades indicating higher emotional intelligence was more prominent in the pandemic than in the control group (74.3% and 50.6%, respectively). Although the final academic grades in both groups increased compared to the initial ones, an increase in the academic achievements representing students' general emotional intelligence and relationship management was significantly higher in the pandemic group. The students stated that the pandemic highlighted the importance of emotional intelligence in stressful situations. However, at the same time, they noted a lack of personal communication as a limitation to social development [2].

It is also argued that the students who participated in the leadership development program during the COVID-19 pandemic demonstrated a significant increase in their emotional intelligence compared to the pre-pandemic program participants. Thus, the pandemic experience could have helped students maintain resilience by further developing their personal and interpersonal skills [1].

The authors of another study believe that distance learning has become an urgent necessity for higher education institutions, imposed by the nature of the emergency conditions in which we live. This is in response to the call for a modern education system that integrates technology and creates flexibility in the teaching/learning environment to achieve educational security and improve learning outcomes [3].

According to other scientists, parents must reflect on their role as facilitators of their children's learning in many ways. The role of a home teacher was rewarding when parents could organize academic support for their child based on their child's learning style, adjusting to the daily rhythm in the family. On the other hand, parents experienced the limits of their skills and resources in assisting their children academically. The provided school assignments and tasks varied from usual task lists to more elaborate online learning. As a result, parents had to adapt their assistance in student-at-home education according to the teacher's instructions and the school's expectations, as well as their skills and conception of their child as a learner [4].

Some authors state that the COVID-19 pandemic may have increased the speed at which students' emotional intelligence is developing, especially regarding relationship management. Also, the additional efforts and work with specialists (counseling) could have conditioned this progress to occur. These findings support the theory that self-reflection and mentoring/counseling can turn challenges into a facilitator of positive personal growth. Therefore, it is necessary to encourage students to reflect on the challenges they have already overcome and exploit the valuable experience as a meaningful catalyst for future development [5].

Lithuanian researchers' scientific study "Distance education of children during the COVID-19 pandemic: threats and opportunities from an ecosystem perspective" revealed the consequences caused by the COVID-19 pandemic. The researchers noted that the quarantine significantly negatively impacted children: staying home caused more psychological damage than the virus-inflicted physical illness. Closed schools, a lack of outdoor activities, limited social contacts, and changes in eating and sleeping habits disrupted children's everyday lifestyles. They made meeting their fundamental development needs difficult, potentially leading to severe long-term physical and mental health disorders. The negative impact of the quarantine is more reflected in children from dysfunctional families [6]. According to the UN, many children experienced severe psychological stress, domestic violence, coercion, neglect, and exploitation during the pandemic. The statistical data show that the number of children complaining of various somatic symptoms increased from 2.39% to 22% [7,8]. Previous research revealed that students who spent five or more hours per day in front of a computer or TV screen had significantly more somatic symptoms and were characterized by poorer emotional well-being, behavior, and relationships with peers. Nearly one-fifth of these students were characterized by poor or very poor emotional well-being, relationships with their parents, and worsening academic results; slightly more than a third had low academic motivation. Screen time for leisure and entertainment is related to students' poorer emotional well-being and higher risks of compulsive (addictive) internet use. The research also showed that bullying significantly affected the youngest—primary school children (3rd–4th grades)—and students with special educational needs. The links between cyberbullying and children's academic results, motivation, and relationships with parents and classmates became evident [9].

The research questionnaire intended for surveying consisted of 46 questions for parents, 33 for teachers, and 36 for students. The questionnaire also included questions related to the respondents' demographic characteristics (e.g., age, gender, place of residence, income, subjects taught, etc.). A 5-point Likert scale was used to rank the variables in most of the questions. Several open-ended questions were also included to identify the reasons for a given answer. The 5-point Likert scale contained the response value options from 1, indicated as "least significant" to 5, as "most significant." To enter the data into the SPSS matrix, coding 1–5, where a value of 1 was "least significant" and 5 was "most significant," was selected. The digit 3 represented a value of "moderately significant." As it was reasonably assumed that school headmasters would have their individual opinions on the issues under consideration, the research questionnaire included a so-called "forced" scale value option when the respondents could not provide a neutral evaluation of the "I don't know" (no opinion) option. Such coding later allowed for a logical interpretation of the results because stronger agreements with a statement determined higher mean ranks in the descriptive statistics. Theoretically, mean = 5 could represent the highest degree of understanding [10]. Hence, the closer a mean rank was to 5, the stronger the agreement with a statement; the closer a mean rank was to 1, the weaker the agreement with a statement.

First, the frequency of the responses in each block of the variables was calculated to overview the general research data. Mean ranks represented the average evaluation of each variable. The mode allowed for identifying the most common options of each variable. The standard deviation revealed the variation interval of the responses for each variable.

In the following data processing stage, the statistically significant differences representing the demographic characteristics of the respondents in the research instrument were

identified. Completing this stage was based on the one-way analysis of variance (ANOVA). A statistically significant difference was considered at a value of $p < 0.05$.

Since the COVID-19 pandemic is a new phenomenon, various scientific studies have analyzed its relatively short-lived consequences. This sub-section reviews previous scientific studies focused on the issues of distance teaching/learning [11].

The COVID-19 pandemic and distance teaching/learning have already become synonymous in education systems. The COVID-19 crisis has undoubtedly impacted the learning process, learning results, students' emotional state, and families' social and economic well-being [12].

The COVID-19 pandemic has revealed a new reality in our lives. Globalization has caused both positive and negative phenomena, one of which is the COVID-19 pandemic, which more or less affected all countries and areas of life, accordingly. Education is no exception in this context.

At the pandemic's peak in the first half of 2020, when efforts were made to control the spread of the virus, approximately 91% of students worldwide were quarantined and displaced from their regular learning environment [13]. The OECD estimated that by June 2020, nearly 80% of the member and partner countries had already closed schools for over three months, i.e., for almost a third of the average academic year [8]. At the pandemic's peak, UNESCO [9] reported that school closures affected nearly 1.6 billion students in more than 190 countries, or 94% of the world's educated population. Education systems had to transfer from direct contact teaching/learning at school to distance teaching/learning to fulfill their mission during the pandemic. Although a few schools combined distance or hybrid education, this was an exception instead of a regularity. Thus, schools faced a new challenge: how to organize the process of distance teaching/learning, ensure the quality of distance teaching/learning, and measure the impact of distance teaching/learning on students' academic achievements.

Other authors believe there is a need to pay particular attention to organizing appropriate technical conditions for remote learning, especially in rural areas, where young people have complained more often than those living in cities about equipment and internet access problems during the pandemic [10].

The pandemic has particularly highlighted what has been emphasized in international education studies (e.g., PISA) for many years; for instance, the significance of the socio-economic context. The results of various international scientific studies conducted also reflect this.

To research the effects of distance teaching/learning on students' academic progress, Donnelly R. [3] conducted a systematic literature analysis. Eight relevant studies were found, seven providing evidence that students experienced learning losses during the distance learning process. In addition, four studies found that certain demographic student groups experienced more significant learning losses, i.e., demonstrated lower academic results than students with other demographic characteristics. This study delivers two precise results: (1) students experienced learning losses (i.e., demonstrated lower academic results), and (2) learning losses were affected by students' demographic characteristics (e.g., place of residence, family's socio-economic situation).

Similar results were provided by Gandolfi E. [13], who argues that the COVID-19 pandemic has highlighted disparities regarding the availability and quality of educational/learning technologies in the US education system. The research results indicate that distance teaching/learning, caused by the COVID-19 pandemic, was a source of increasing digital exclusion in communities [14]. Low-income and ethnic minority students and families were particularly disadvantaged without full access to the appropriate hardware and software to support teaching/learning.

The OECD report [8] also discusses the significance of the socio-economic context and the inequality of students from different demographic groups. The report proposes that those from privileged families will easily find a way to eliminate the gaps caused by distance teaching/learning and focus on alternative teaching/learning opportunities. On

the contrary, if school is closed, individuals from dysfunctional families (an unfavorable socio-economic context) will be “restricted” only to the services provided by the school.

The COVID-19 crisis has revealed many aspects of inequality in education systems in different countries, starting from the broadband and computers needed for distance teaching/learning and ending with the conducive environment necessary to focus on learning, the competence of headteachers and education managers at different levels to organize distance teaching/learning, and the competence of teachers to deliver quality distance teaching/learning.

Zhao Y. [15] researched the effects of distance teaching/learning during the COVID-19 pandemic on students (1st–9th grades), parents, and teachers in China. The results showed that 76% of the respondents (parents) believed that distance teaching/learning was acceptable. Teachers, however, were concerned that it could have a negative effect on students’ interest, concentration, and academic performance. In total, 69% of the parents reported that their children tended to spend more than 3 h a day in front of a screen, and 82% reported that their children had less than 2 h of the time they would typically spend on outdoor physical activities. Furthermore, 95% of the parents expressed their concern about their children’s vision. Additionally, following the results of the parent-rated Strengths and Difficulties Questionnaire (SDQ), 17.6% of the students were found to have emotional or behavioral problems. The Self-Assessment Anxiety Scale (SAS) results showed higher-than-normal anxiety levels in the parent–teacher population.

Thus, the results propose that although the parents tended to assess distance teaching/learning favorably, they still felt latent anxiety about the potential negative consequences of this teaching/learning.

Korzycka M. [16] notes that all schools in Poland were closed during the COVID-19 pandemic, and teachers were obliged to provide distance teaching. The authors analyzed the difficulties of distance teaching/learning during the coronavirus pandemic in Poland from the perspective of students and with consideration of the demographic aspects.

2. Methodology

The study was conducted based on the collected data used to assess gifted children. Therefore, taking this into account, it was hypothesized that distance education as a consequence of COVID-19 could have created conditions for the IQ level of students. Since the WASI methodology (short scale) was used to assess students, based on the collected data, the change in the IQ of the students was examined in terms of assessment, verbal, non-verbal, and general IQ. The students were grouped into three 6–10-, 11–15-, and 16–19-year age groups. Then, per year, the average IQ in the studied age group was analyzed, and the change in IQ for each year was also compared.

During the research, the exceptionality of students born in 2009 was noticed, i.e., the average general IQ of students born this year was the highest (134 in 2018). Still, over five years, students’ IQs decreased (119 in 2022). After analyzing the socio-economic environment, it was noticed that at that time, the state had launched the most favorable program for families, which made it possible for one parent to receive salary-sized support from the state for two years. Hence, one parent chose not to work for two years but to stay with the child and raise them. Based on the theory that constant communication with a child during the first two years significantly influences their IQ level and further development, it was concluded that this led to a higher IQ level in children born in 2009.

Further decline in IQ can be attributed to the current education system prioritizing actions that do not promote IQ growth, i.e., focusing mainly on the level of students’ knowledge rather than valuing the students’ creativity. Notably, the schools that select gifted children intend to encourage those with the highest results to test and evaluate their knowledge by purposefully participating in interschool Olympiads. For this reason, such schools pay the most attention to the students who demonstrate the best learning results.

In Lithuania, in the city of Kaunas, a group of 6–19-year-olds with higher achievements in science was selected. The IQ tests were conducted according to the WASI methodology

in the period of five years, 2017, 2018, 2019, 2021, and 2022, respectively. The aim was to compare average general, verbal, and non-verbal IQ before and after the COVID-19 pandemic, engaging over 2000 respondents.

The methods used during the research were WASI, mathematical/statistical methods, empirical analysis, and correlational analysis. The objective was to receive no more than 2% error with 95% reliability. Based on the sample size calculator, it was determined that the sample size should be around 2000 respondents. Also, the Paniotto formula was used.

3. Study Limitations

As with other studies, this study was subject to certain risks and uncertainties that may have affected the scope and completeness of the study's findings. However, the shortcomings listed below did not significantly impact the research results.

To achieve more objective results, the study should have been conducted not in one region of Lithuania but in several areas. Also, according to the respondents, there could have not been only students with high academic achievements, which would have given the research completeness. However, in that case, the number of respondents should have been higher. Notably, the study was conducted based on existing (previously collected) data.

4. Results

The Impact of Distance Teaching/Learning on Students' IQs

Scientific studies were conducted to measure students' IQ in the post-pandemic period. In the post-pandemic period, it was hypothesized that distance teaching/learning impacted students' verbal, non-verbal, and general IQ. Authors who measured collective intelligence and conducted metacognition research argue that practical cooperation and teamwork depend greatly on social metacognitive skills—the ability to evaluate and control one's mental processes that serve social problem-solving. Nevertheless, despite their importance, metacognitive skills can be inadequate measures of general intelligence [17].

Summarizing lessons learned during distance learning, different school community representatives emphasized different aspects [18]. According to other authors, schools sought quality by collecting feedback from teachers, students, or parents on the learning process. The teachers evaluated the quality of their lessons in various ways, i.e., collecting information from students, giving/getting feedback, and discussing the quality of distance lesson aspects and distance learning individually.

The impact of distance teaching/learning on students' IQs was assessed using and applying the WASI scale, and the researchers measured the IQ of students aged 6–19 in 2017, 2018, 2019, 2021, and 2022, respectively (Tables 1–5).

Table 1. Students' IQ in 2017.

Age Groups	Verbal IQ	Non-Verbal IQ	General IQ
Primary school students (aged 6–10)	118.09	113.26	114.85
Junior high school students (aged 11–15)	119.75	119.27	116.57
Senior high school students (aged 16–19)	118.33	112.75	117.06
Average	118.72	115.09	116.16

Table 2. Students' IQ in 2018.

Age Groups	Verbal IQ	Non-Verbal IQ	General IQ
Primary school students (aged 6–10)	121.91	107.59	116.81
Junior high school students (aged 11–15)	127.92	110.78	121.53
Senior high school students (aged 16–19)	120.13	109.84	118.05
Average	123.32	109.40	118.80

Table 3. Students' IQ in 2019.

Age Groups	Verbal IQ	Non-Verbal IQ	General IQ
Primary school students (aged 6–10)	121.09	120.93	128.78
Junior high school students (aged 11–15)	110.5	105.33	110.67
Senior high school students (aged 16–19)	120.84	117.43	121.8
Average	117.48	114.56	120.42

Table 4. Students' IQ in 2021.

Age Groups	Verbal IQ	Non-Verbal IQ	General IQ
Primary school students (aged 6–10)	135.84	131.24	138.36
Junior high school students (aged 11–15)	125.00	120.75	126.08
Senior high school students (aged 16–19)	123.00	123.00	127.00
Average	127.95	125.00	130.48

Table 5. Students' IQ in 2022.

Age Groups	Verbal IQ	Non-Verbal IQ	General IQ
Primary school students (aged 6–10)	123.01	114.46	121.05
Junior high school students (aged 11–15)	119.26	111.89	117.86
Senior high school students (aged 16–19)	115.47	109.67	114.26
Average	119.25	112.00	117.72

When comparing different age groups (Tables 6–9), the general IQ of primary school students tended to increase in 2017, 2018, 2019, and 2021 but dropped in 2022. A similar situation can be observed regarding verbal students' IQ—in 2017, 2018, 2019, and 2022, the verbal IQ of primary school students tended to increase, but in 2022, it decreased significantly.

Table 6. IQ of the students aged 6–10 in 2017, 2018, 2019, 2021, and 2022.

Year	Verbal IQ	Non-Verbal IQ	General IQ
2017	118.09	113.26	114.85
2018	121.91	107.59	116.81
2019	121.09	120.93	128.78
2021	135.84	131.24	138.36
2022	123.01	114.46	121.05

Table 7. IQ of the students aged 11–15 in 2017, 2018, 2019, 2021, and 2022.

Year	Verbal IQ	Non-Verbal IQ	General IQ
2017	119.75	119.27	116.57
2018	127.92	110.78	121.53
2019	110.5	105.33	110.67
2021	125.00	120.75	126.08
2022	119.26	111.89	117.86

Table 8. IQ of the students aged 16–19 in 2017, 2018, 2019, 2021, and 2022.

Year	Verbal IQ	Non-Verbal IQ	General IQ
2017	118.33	112.75	117.06
2018	120.13	109.84	118.05
2019	120.84	117.43	121.8
2021	123.00	123.00	127.00
2022	115.47	109.67	114.26

Table 9. Comparison of the differences in students' IQ in 2017, 2018, 2019, and 2021 with their IQ in 2022.

Year	Verbal IQ	Non-Verbal IQ	General IQ
Students aged 6–10			
2017	4.92	1.2	6.2
2018	1.1	6.87	4.24
2019	1.92	−6.47	−7.73
2021	−12.83	−16.78	−17.31
Students aged 11–15			
2017	−0.49	−7.38	1.29
2018	−8.66	1.11	−3.67
2019	8.76	6.56	7.19
2021	−5.74	−8.86	−8.22
Students aged 16–19			
2017	−2.86	−3.08	−2.8
2018	−4.66	−0.17	−3.79
2019	−5.37	−7.76	−7.54
2021	−7.53	−13.33	−12.74

The results indicate that the general IQ of junior high school students tended to increase in 2017, 2018, and 2021, but in 2019 and 2022, it dropped significantly. The repeated situation can be observed with regard to verbal IQ; in 2017, 2018, 2019, and 2021, the verbal IQ of junior high school students tended to increase, but in 2022, it decreased significantly.

The general IQ of senior high school students tended to increase in 2017, 2019, and 2021, but in 2018 and 2022 it dropped significantly. The same situation can be observed with regard to verbal IQ; in 2017, 2018, 2019, and 2021 the verbal IQ of senior high school students tended to increase, but in 2022 it decreased significantly.

Although the drop in IQ is observed in all age groups, the most significant decline in general IQ, equal to −17.31 points, was in the group of students aged 6–10. When comparing the research data of 2021 and 2022, there was a dramatic decrease in primary school students' non-verbal and verbal IQ (−16.78 and −12.83 points, respectively). In 2022, there was a significant drop in the students' verbal, non-verbal, and general IQ compared to the 2017, 2018, 2019, and 2021 years (Table 10).

Table 10. The average results of the students' IQ tests in 2017, 2018, 2019, 2021, and 2022.

Year	Verbal IQ	Non-Verbal IQ	General IQ
2017	118.72	115.09	116.16
2018	123.32	109.40	118.80
2019	117.48	114.56	120.42
2021	127.95	125.00	130.48
2022	119.25	112.00	117.72

The data analysis revealed a significant difference between students' verbal, non-verbal, and general IQ in 2021 and 2022. In 2022, all parameters were at a similar level as in 2017, 2018, and 2019. Since the 2021 tests were conducted in the second half of the year when distance teaching/learning was ending, and students were returning to contact classes, it can be stated that distance teaching/learning positively affected students' IQ.

However, the results of other authors, who researched students' mental health during the pandemic, revealed that the pandemic significantly impacted students' mental health. Students were worried about their general safety and asked for various forms of counseling, including psychological help. They expressed concerns about the rapid transition to distance teaching/learning, had fears about their life security, and were prone to depression. It was concluded that students' mental health had deteriorated significantly. Distance teaching/learning was found to be less effective than contact teaching/learning [19].

The test of the IQs of students born in 2009 revealed that the general IQ of the test participants was gradually decreasing in 2018, 2019, 2021, and 2022 (see Table 11).

Table 11. Analysis of the general IQ of students born in 2009.

Year	2018	2019	2021	2022
IQ	134	127	122	119

These results could have been affected by the current education system that tends to prioritize educational programs rather than promoting IQ development.

It is believed that parents of children born in Lithuania in 2009 were provided more favorable conditions for raising children than the EU standards: financially well-supported parents could stay with their children at home for 24 months and educate their children themselves. This could have contributed to the high general IQ of the children in 2018 and a subsequent decrease in their IQ in 2019, 2021, and 2022. This tendency could have been caused by the insufficient flexibility of the education system, which tended to focus more on the individual child's abilities rather than include children in a general education model.

The analysis of previous scientific studies and publications proposes that the population's intelligence directly impacts a country's economic growth, which manifests itself not only as innovativeness and the creation of innovations but also as intolerance to the shadow economy. Notably, society's higher intelligence impacts the creation of a more favorable socio-economic environment.

5. Discussion

In 2020, the world faced a new challenge—the COVID-19 pandemic, during which information and communication technologies allowed for providing distance teaching/learning. In this study, we assumed that distance teaching/learning could have had a negative impact on students' IQ. The IQs of bright students in 2017, 2018, 2019, and 2021 were compared with their IQs in 2022 to verify this assumption. In 2022, the gymnasiums/schools where the students were selected for the IQ test applied the same student admission criteria as in 2017, 2018, 2019, and 2021.

The major uncertainties were as follows:

- It was not clear whether distance teaching/learning had had any effect on students' IQ;
- If distance teaching/learning had affected students' IQ, it was not clear which age group was affected most significantly;
- It was not clear which—verbal, non-verbal, or general—IQ had been affected most significantly;
- As an additional uncertainty, the impact of constant communication with parents in the first year of a child's life on their IQ at older ages was assessed.

Does intelligence affect a country's economic growth? James C. Hayton reviewed 237 studies and found that intelligence is of great importance in high-tech companies [20]. Yang found a strong relationship between the number of highly intelligent people and the number of patentable new products or processes in Taiwan [21]. Having researched the effect of intelligence on the shadow economy, Tran found that when the population's intelligence increased, the size of the shadow economy decreased [22].

A literature analysis revealed that the number of studies to empirically investigate the relationship between intellectual capital management and innovativeness in R&D institutions is not significant. Furthermore, no sources were found to extend the analysis, including technological orientation as a strategic approach toward developing innovative capabilities. The paper attempted to fill the gap observed in previous studies and aimed to investigate the impact of intellectual capital management on innovativeness in an R&D institution while assessing the relationship with technological orientation. For instance, one study was based on the theoretical assumptions of the intellectual-capital-oriented firm and the dynamic capabilities approach [23]. The research proposed that intellectual capital management through human, structural, and relational capital components positively affects innovativeness in an R&D institution. In addition, it was hypothesized that human capital and innovativeness positively affect innovativeness in an R&D institution. The research applied a PLS-SEM analysis and was based on a sample of $n = 61$ R&D institution employees. The data were collected using a questionnaire to measure intellectual capital management through the components of human, structural, and relational capital, innovativeness, and technological orientation. The findings support a significant direct effect of structural and relational capital on innovativeness and a positive direct effect of human capital and innovativeness on technological orientation. This study is an original contribution to the academic literature, bringing new evidence on the relationship between intellectual capital management, innovativeness, and technological orientation in an R&D institution in Eastern Europe [24].

An analysis of the scientific publications focused on the impact of intelligence on economic processes revealed that the scientific literature still needs studies addressing the direct relationship between a population's average intelligence and a country's economic growth. Thus, this study may enrich the literature by examining the impact of intelligence on corporate competitiveness, patentable innovative products, and innovativeness in R&D institutions.

The analysis of previous scientific studies and publications proposes that the population's intelligence directly impacts a country's economic growth, manifesting itself not only as innovativeness and the creation of innovations but also as intolerance to the shadow economy.

6. Conclusions

1. The 2021 tests were conducted after the end of distance teaching/learning; the results propose that distance teaching/learning positively affected students' IQ. Such results can be associated with a more significant number of independent tasks, which influenced the growth of creativity.
2. The IQ test of students born in 2009 revealed that the total IQ of test participants gradually decreased in 2018, 2019, 2021, and 2022.
3. These results may have been influenced by the current education system, which favors educational programs that do not promote IQ development. It is believed that the

- parents of children born in Lithuania in 2009 were provided more favorable conditions for raising children than EU standards.
4. The IQ of the 6–15-year-old students tended to grow from 2017 to 2021, but in 2022, a dramatic drop could be observed. During distance teaching/learning, students socialized and communicated less, which became one of the primary reasons for the decline in their IQ.
 5. The analysis results show that distance teaching/learning negatively affected all student age groups, but the most significant adverse effect was in the group of students aged 6–10 years.
 6. During the research, the uniqueness of students born in 2009 was noticed, i.e., the overall average IQ of the students born that year was the highest (134 in 2018), but in five years, the students' IQ of has indeed decreased (119 in 2022). After analyzing the socio-economic environment, it was noticed that the state started the most favorable program for families at that time.

Author Contributions: Conceptualization, V.G., R.Č., G.C. and S.M.; methodology, V.G., R.Č., G.C. and S.M.; formal analysis, V.G., R.Č., G.C., S.M. and E.G.; investigation, V.G., R.Č., G.C., S.M. and E.G.; resources, V.G. and E.G.; data curation, V.G., R.Č. and G.C.; writing—original draft preparation, V.G., R.Č., G.C. and S.M.; writing—review and editing, V.G., R.Č., G.C., S.M. and E.G.; visualization, supervision, V.G.; project administration, R.Č.; funding acquisition, E.G. All authors have read and agreed to the published version of the manuscript.

Funding: This project has received funding from European Regional Development Fund 13.1.1-LMT-K-718-05-0013 under grant agreement with the Research Council of Lithuania (LMTLT). Funded as European Union's measure in response to Cov-19 pandemic.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Goodlet, K.J.; Raney, E.; Buckley, K.; Afolabi, T.; Davis, L.; Fetterkether, R.M.; Jones, M.; Larson, S.; Tennant, S. Impact of the COVID-19 Pandemic on the Emotional Intelligence of Student Pharmacist Leaders. *Am. J. Pharm. Educ.* **2022**, *86*, 8519. [CrossRef] [PubMed]
2. Moreno-Fernandez, J.; Ochoa, J.J.; Lopez-Aliaga, I.; Alferez MJ, M.; Gomez-Guzman, M.; Lopez-Ortega, S.; Diaz-Castro, J. Lockdown, Emotional Intelligence, Academic Engagement and Burnout in Pharmacy Students during the Quarantine. *Pharmacy* **2020**, *8*, 194. [CrossRef] [PubMed]
3. Donnelly, R.; Patrinos, H.A. Learning Loss during Covid-19: An Early Systematic Review. *Prospects* **2022**, *51*, 601–609. [CrossRef] [PubMed]
4. Koskela, T.; Pihlainen, K.; Piispa-Hakala, S.; Vornanen, R.; Hämäläinen, J. Parents' Views on Family Resiliency in Sustainable Remote Schooling during the COVID-19 Outbreak in Finland. *Sustainability* **2020**, *12*, 8844. [CrossRef]
5. Zysberg, L.; Zisberg, A. Days of Worry: Emotional Intelligence and Social Support Mediate Worry in the COVID-19 Pandemic. *J. Health Psychol.* **2022**, *27*, 268–277. [CrossRef] [PubMed]
6. Li, D.; Liu, R.; Wei, S.; Li, T.; Cai, J.; Ge, H. Infection Prevention and Control Measures during COVID-19 from Medical Physics Perspective: A Single Institution Experience from China. *J. Appl. Clin. Med. Phys.* **2020**, *21*, 221–222. [CrossRef] [PubMed]
7. Huang, R.H.; Liu, D.J.; Tlili, A.; Yang, J.F.; Wang, H.H.; Zhang, M.; Lu, H.; Gao, B.; Cai, Z.; Liu, M.; et al. *Handbook on Facilitating Flexible Learning during Educational Disruption: The Chinese Experience in Maintaining Undisrupted Learning in COVID-19 Outbreak*; Smart Learning Institute of Beijing Normal University: Beijing, China, 2020. Available online: https://iite.unesco.org/wp-content/uploads/2020/03/Handbook-on-Facilitating-Flexible-Learning-in-COVID-19-Outbreak-SLIBNU_V2.0_20200324.pdf (accessed on 1 March 2023).
8. OECD. *Education at a Glance 2022: OECD Indicators*; OECD Publishing: Paris, France, 2022. [CrossRef]
9. UNESCO Covid-19 Education Response. Available online: <https://resourcecentre.savethechildren.net/pdf/75890.pdf/> (accessed on 1 March 2023).
10. Lassoued, Z.; Alhendawi, M.; Bashitialshaaer, R. An Exploratory Study of the Obstacles for Achieving Quality in Distance Learning during the COVID-19 Pandemic. *Educ. Sci.* **2020**, *10*, 232. [CrossRef]

11. Hu, Y.H. Effects of the COVID-19 Pandemic on the Online Learning Behaviors of University Students in Taiwan. *Educ. Inf. Technol.* **2022**, *27*, 469–491. [CrossRef] [PubMed]
12. Halpern, C. Distant learning: The Experiences of Brazilian Schoolteachers during the Covid-19 School Closures. *J. Ethn. Cult. Stud.* **2021**, *8*, 206–225. [CrossRef] [PubMed]
13. Gandolfi, E.; Ferdig, R.E.; Kratcoski, A. A New Educational Normal an Intersectionality-Led Exploration of Education, Learning Technologies, and Diversity during COVID-19. *Technol. Soc.* **2021**, *66*, 101637. [CrossRef] [PubMed]
14. Sarkar, S.; Ghosh, A.; Ray, B.; Dasgupta, A.; Sarkar, A. Perception and Attitude toward Online Versus Traditional Anatomy Teaching: An Internet-Based Cross-Sectional Study among Indian Medical Students during COVID Pandemic. *Asian J. Med. Sci.* **2022**, *13*, 27–33. [CrossRef]
15. Zhao, Y.; Guo, Y.; Xiao, Y.; Zhu, R.; Sun, W.; Huang, W.; Liang, D.; Tang, L.; Zhang, F.; Zhu, D.; et al. The Effects of Online Homeschooling on Children, Parents, and Teachers of Grades 1-9 during the COVID-19 Pandemic. *Med. Sci. Monit.* **2020**, *26*, e925591-1–e925591-10. [CrossRef] [PubMed]
16. Korzycka, M.; Bójko, M.; Radiukiewicz, K.; Dzielska, A.; Nałęcz, H.; Kleszczewska, D.; Małkowska-Szkutnik, A.; Fijałkowska, A. Demographic Analysis of Difficulties Related to Remote Education in Poland from the Perspective of Adolescents during the Covid-19 Pandemic. *Ann. Agric. Environ. Med.* **2021**, *28*, 149–157. [CrossRef] [PubMed]
17. Realyvásquez-Vargas, A.; Maldonado-Macías, A.A.; Arredondo-Soto, K.C.; Baez-Lopez, Y.; Carrillo-Gutiérrez, T.; Hernández-Escobedo, G. The Impact of Environmental Factors on Academic Performance of University Students Taking Online Classes during the COVID-19 Pandemic in Mexico. *Sustainability* **2020**, *12*, 9194. [CrossRef]
18. Dauksiene, E.; Naujokaitiene, J.; Trepule, E.; Tereseviciene, M.; Volungeviciene, A.; Adomaitis, I.; Krivickiene, V. Theoretical and Empirical Research Report of the Project “Organising Distance Education during the Pandemic and Other Crisis Situations” (Summary). 2020. Available online: <https://studyonline.lt/wp-content/uploads/2021/04/Teorinio-ir-empirinio-tyrimo-ataskaitos-santrauka.pdf> (accessed on 1 March 2023).
19. Tran, B.X.; Vo, L.H.; Phan, H.T.; Pham, H.Q.; Vu, G.T.; Le, H.T.; Latkin, C.A.; Ho, C.S.; Ho, R.C. Mobilizing Medical Students for COVID-19 Responses: Experience of Vietnam. *J. Glob. Health* **2020**, *10*, 020319. [CrossRef] [PubMed]
20. Hayton, J.C. Competing in the New Economy: The Effect of Intellectual Capital on Corporate Entrepreneurship in High-Technology New Ventures. *R&D Manag.* **2005**, *35*, 137–155.
21. Yang, C.-H. Effects of Strengthening Intellectual Property Rights in Newly Industrialized Economies: Evidence from Taiwan’s 1994 Patent Reform. *Contemp. Econ. Policy* **2008**, *26*, 259–275. [CrossRef]
22. Tran, T.P.; Nguyen, P.V.; Nguyen, Q.L.; Tran, N.P.; Vo, D.H. Does National Intellectual Capital Matter for Shadow Economy in the Southeast Asian Countries? *PLoS ONE* **2022**, *17*, e0267328. [CrossRef] [PubMed]
23. Carroll, C.; Conway, R.; O’Donnell, D.; Norton, C.; Hogan, E.; Browne, M.; Buckley, C.M.; Kavanagh, P.; Martin, J.; Doyle, S. Routine Testing of Close Contacts of Confirmed COVID-19 Cases—National COVID-19 Contact Management Programme, Ireland, May to August 2020. *Public Health* **2021**, *190*, 147–151. [CrossRef] [PubMed]
24. Dinu, E. Exploring the Effect of Intellectual Capital Management on Innovativeness in a R&D Institute. *Manag. Dyn. Knowl. Econ.* **2022**, *10*, 225–238. [CrossRef]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.