The impact of the COVID-19 pandemic on students' skills - case study

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To cite this article:
Munteanu, I.-D. (2025). The impact of the COVID-19 pandemic on students' skills - case study. Romanian Journal of Economics, 60(1), pp. 66-74.

Abstract. ***Objective****: The educational system represents one of the most important pillars of a society. It contributes significantly to the formation of the labour supply in an economy, as well as to its economic development. It is well known that education, both secondary and tertiary, has a direct influence on the reduction of economic gaps between regions. However, the education system has been deeply affected by the COVID-19 pandemic. During online classes, the teaching-learning-evaluation activity suffered. The present paper is trying to capture, on one side, what changes were brought by COVID-19 pandemic and, on the other side, how affected the students' knowledge was. A poorer preparation of students leads to a poorer prepared workforce. Therefore, this analysis is relevant for a better understanding of the present educational system.* ***Method****: This case study is based on a statistical analysis carried out following a survey in a high school in Bucharest. The advantages of this method consist in the possibility of providing anonymous answers, which means that the data are not biased, and in the accessibility of the data. Through the survey, data could be collected that would not otherwise be available through official statistics. Thus, statistical survey offers a systematic and reliable approach to collecting data, making them a valuable tool for research. Applying the questionnaire face to face, 265 answers were obtained from young people aged between 15-17 years. They are part of the students of the "Ion Creanga" high school in Bucharest and are representative of the school population of Bucharest.* ***Results****: The survey results are interesting. The students answered honestly, and this is valuable in the given context. They say that, in the context of the COVID-19 pandemic, the educational system has undergone an accelerated digitization, which is beneficial. The students declare that digital teaching tools are currently used in many of the lessons. Also, they use digital learning tools at school or at home. Regarding the evaluation, students declare that they cheat most of the online evaluations, while this is more difficult in the case of classic evaluations. They also declare that the grades obtained during the exclusively online courses do not reflect reality. This is important to underline precisely because it illustrates a poor preparation of the students in that period and a gap in their knowledge. These results provide an overview of the post-pandemic Romanian educational system.* ***Originality****: The originality of the work consists mainly in the collected data. They reflect a reality of the educational system and provide relevant information about the quality of the lessons held during the pandemic, but also afterwards. Also, highlighting these results allows for a clearer picture on the changes brought by the pandemic on the skills that nowadays students have. It is a subject of interest both for the institutions of the educational system and for any other person interested in this subject.*

Keywords*: education, skills, COVID-19, statistical analysis, survey, Romania*
JEL classification*: I21, I29, C19*

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1. Introduction

In the annals of modern history, few events have had as profound and far-reaching an impact as the COVID-19 pandemic. The reverberations of this global crisis have been felt across every facet of society. Among the many areas profoundly affected by the pandemic, education stands out as one of the most critically disrupted. As the virus spread rapidly across the globe, educational institutions were forced to close their doors, pivoting to remote and online learning techniques. This sudden shift posed significant challenges for students, educators, and policymakers alike.

The transition to online learning, while necessary to curb the spread of the virus, exposed and exacerbated existing inequalities within the education system. Students from disadvantaged backgrounds, lacking access to reliable internet and digital devices, faced significant barriers to effective learning. Meanwhile, educators struggled to adapt their teaching methods to virtual platforms, often without adequate training or resources. These challenges were compounded by the psychological toll of the pandemic, with students grappling with anxiety, isolation, and uncertainty about the future.

As the world slowly emerges from the shadow of COVID-19, it is crucial to examine the lasting impact of the pandemic on students' skills. This case study seeks to explore how the abrupt shift to remote learning has influenced the academic, social, and emotional development of students. One of the primary areas of concern is the potential learning loss experienced by students during prolonged periods of school closures and remote learning. Research suggests that disruptions to traditional classroom instruction can result in significant setbacks in academic achievement, particularly in subjects such as mathematics and literacy. Additionally, the lack of face-to-face interaction with teachers and peers has raised concerns about the development of critical social and emotional skills, which are essential for students' overall well-being and future success.

While the pandemic has undoubtedly posed significant obstacles, it has also prompted innovation and creativity in education. From the rapid development of online learning platforms to the emergence of new pedagogical approaches, the crisis has catalysed a reimagining of education that could have long-term benefits.

The COVID-19 pandemic has been a transformative event for education, reshaping the way students learn and develop. This case study will explore the multifaceted impact of this crisis on students' skills, providing a detailed and comprehensive examination of the challenges faced and the lessons learned. Through this analysis, we hope to contribute to the ongoing discourse on how to build a more resilient and equitable education system for all students.

2. Literature review

The COVID-19 pandemic has not only affected Romania, but the whole globe. Thus, starting in 2020, one by one, all countries resorted to closing educational institutions to prevent the spread of the virus even more rapidly. Thus, all activities have moved online regardless of the schooling level, primary, secondary or tertiary (Li, et al., 2021), and this has ushered in a new era of technology (Korkaz, et al., 2022) Although the pandemic has seen an increase in internet access, it has also created educational inequalities deepened by gender, poverty and disability (Jones, et al., 2021). However, digitization has been discussed for a long time, but the pandemic is the one that highlighted even more the importance of this process in any field, even more so in that of education (Safonov et al., 2022). Before the COVID-19 pandemic, the educational system met tangentially with digitization, this being for various reasons, such as the lack of funds for the purchase of equipment, the lack of training courses in this regard for teachers or the negative attitudes of the staff involved towards technology (Azorin et al., 2020). The negative attitudes of the staff can be understood since digitization also involves risks that must be taken into account. These risks are related to copyright infringement, security or information leakage. However, for digitalization to work as it should and have the right effect, there must be a well-organized system that constantly supervises and evaluates the way in which this process is implemented (Safonov, 2022). Moreover, digitization is based

on three main pillars: culture, education, skills; infrastructure and technology; ecosystem (Brunetti et al., 2020). The first pillar indicates the link between digitization and the education system, a significant link for the current context. The second pillar indicates that without infrastructure, digitization cannot be achieved, and together with the first pillar it forms an efficient ecosystem. Thus, digitization does not only involve the introduction and use of technology, but also involves a fundamental change in the structure, management, objectives, quality of the educational act or the development of human capital (Luk'yanenko & Stepanenko, 2018).

The use of technology in teaching and learning leads to the simplification of the educational process, which allows the adaptation of the education system to current requirements (Marks et al., 2020). This is also confirmed by Areshonkov (2020) in a study carried out in Ukraine at the beginning of the COVID-19 pandemic, but also by Bessarab et al. (2022) which concludes that in order to function properly in today's society, people must integrate the concept of digitization in their activities.

However, the rapid digitization of the education system that took place with the onset of the pandemic had a series of negative effects. A telephone survey study in Peru, India, Vietnam and Ethiopia concluded that due to the COVID-19 pandemic, compared to 2016, students lost a large share of skill acquisition and the dropout rate increased (Favara, et al., 2022). According to the same study, in Ethiopia, only one in 10 students surveyed maintained contact with teachers during the pandemic. This is because in low- and middle-income countries, access to the Internet and technology, the tools needed for distance learning, is low and unevenly distributed. Another study, conducted in South Korea, showed that regional differences existed even before the pandemic, but online education led to their accentuation (Dohyo, et al., 2023). These differences were caused by the resources available to the students, by the fact that, for a while, things were unclear and the teachers were unprepared. Students in underdeveloped areas had more limited access to online education. The education system has proven to be vulnerable.

3. Methodology and data

Public data on key indicators of the system do not provide information about the quality of teaching-learning-assessment activities. Therefore, a questionnaire was designed for students with the aim of presenting the reality on the ground. This is a method used for collecting data in social sciences, allowing researchers to gather information from a large population efficiently and effectively. The design and implementation of a questionnaire require careful planning to ensure the reliability and validity of the data collected. The first step involves defining the objectives, formulating clear and concise questions, and determining the appropriate question types (e.g., open-ended, closed-ended, Likert scales) (Fowler, 2013). The wording of questions is crucial; ambiguous or leading questions can bias the responses and undermine the survey's validity (Dillman, Smyth, & Christian, 2014).

Questionnaires can be administered through various modes, including face-to-face interviews, telephone interviews, mail surveys, and online surveys. Each mode has its advantages and limitations. For instance, online surveys offer cost efficiency and speed but may suffer from low response rates and sample bias if internet access is unevenly distributed among the target population (Couper, 2008).

This questionnaire was constructed in five sections. Each section aimed to collect relevant information about an important aspect. The first section of the questionnaire contains ten questions about the teaching activities. The purpose of this section was to identify the teaching methods imposed by online learning that are still being used today, as well as the main reasons, from the students' perspective, that motivate teachers to make these choices. The second section of the questionnaire contains four questions related to the students' own learning activities. The third section of the questionnaire includes ten questions about assessment activities. These questions aimed to identify the extent to which digital assessment methods are still being used and the degree of fraud associated with them. The same questions were posed to the teachers to allow for a comparison between the two perspectives and to accurately depict the overall reality. The fourth section of the questionnaire contains nine statements. Respondents were required to rate these statements on a scale from 1 to 5, where 1 means they strongly disagree with the statement and 5

means they strongly agree. The statements focused on the changes imposed by the COVID-19 pandemic on teaching-learning-assessment activities and the social climate in the classroom. The final section of the questionnaire comprises five questions aimed at profiling the respondents.

The questionnaire was administered online from October 2, 2023, to October 8, 2023, and was distributed among students of the "Ion Creangă" National College in Bucharest. The response rate of the questionnaire was 25%. A total of 265 responses were collected.

The objectives of this study were divided into two categories:

1. General Hypotheses: These refer to the results of the empirical research, validated based on the researcher's logical reasoning.

2. Statistical Hypotheses: These refer to the results of the empirical research and identify a connection between two or more variables (Constantin & Tecău, 2013).

The general hypothesis of this analysis is:

The COVID-19 pandemic has brought significant changes to the teaching-learning-assessment activities within the Romanian education system.

The statistical hypotheses of this analysis are:

Hypothesis 1: As a result of the COVID-19 pandemic, teachers have adopted teaching methods using digital tools.

Hypothesis 2: As a result of the COVID-19 pandemic, teachers have adopted assessment methods using digital tools.

Hypothesis 3: Digital assessment tools have an increased risk of fraud.

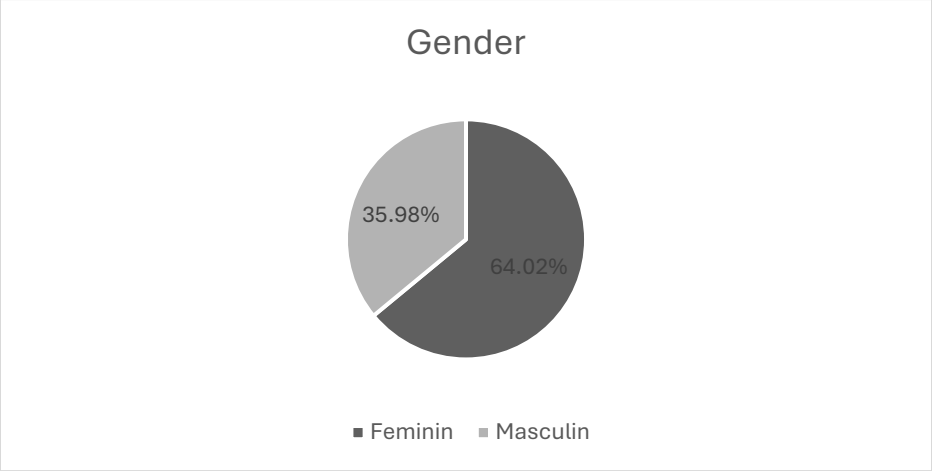
Hypothesis 4: Fraudulent assessments contaminate the people involved.

Hypothesis 5: As a result of the COVID-19 pandemic, students demonstrate weaker preparation.

4. Research results and comments

The distribution of respondents by gender can be observed in the figure below, with the majority being female.

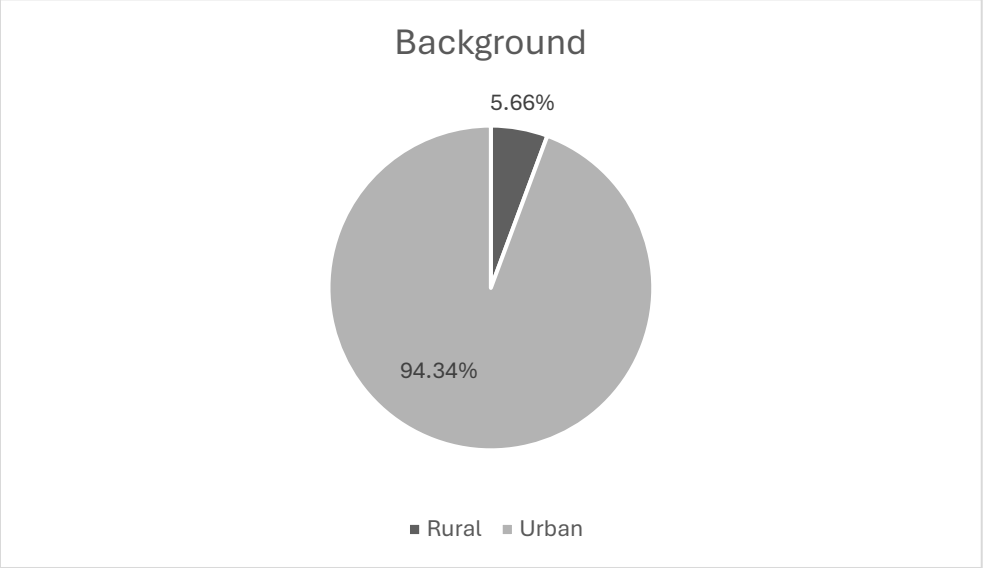
Figure 1. The distribution of respondents by gender



Source: Author's own representation.

Regarding the respondents' background, approximately 6% reported residing in rural areas. This indicates that this educational institution attracts students from various regions, not just Bucharest.

Figure 2. The distribution of respondents by background



Source: Author's own representation.

The first question in the section dedicated to teaching activities addressed the use of digital tools such as PowerPoint presentations, educational platforms, smartboards, videos, and other available online audio-visual resources, educational games, etc. The proportion of respondents who state that these methods are currently used is 97%. Among those who affirm the presence of digital teaching tools, 65% of them say these methods are used in over 50% of the classes. This confirms that one of the changes imposed by the COVID-19 pandemic was both useful and long-lasting.

Table 1. Answers to questions regarding the current use of digital tools in teaching activity

Questions	1	2	3	4	5
Motivate to what extent you believe the presence of technological infrastructure in the school contributes to the use of digital tools in classroom activities	2	18	94	94	49
Motivate to what extent you believe that having good digital skills on the part of teachers contributes to the use of digital tools in classroom activities	1	8	39	106	103
Motivate to what extent you believe that the increased efficiency of these digital tools contributes to the use of digital tools in classroom activities	1	9	82	101	64
Motivate to what extent you believe the lack of technological infrastructure in the school contributes to the non-use of digital tools in classroom activities	1	1	2	1	3
Motivate to what extent you believe the poor preparation of teachers regarding the use of these digital tools contributes to the non-use of digital tools in classroom activities	2		1	3	2
Motivate to what extent do you believe that favoring traditional teaching methods by teachers contributes to the non-use of digital tools in classroom activities			3	1	4

Source: Author's own representation.

In the first part of Table 1, responses from those who declared that digital tools are still being used in teaching activities are grouped. Only 55% of respondents believe that the available technological infrastructure in the school greatly or very greatly influences teachers' decisions to use these tools. This is interesting, as students placed more emphasis on teachers' digital competencies. 81% of them believe these play an important or very important role in the use of digital tools. In this case, students evaluated their teachers and their competencies in using technology. Regarding the effectiveness of these methods, 64% of respondents consider this criterion important or very important in teachers' decisions to use these tools. Thus, it can be concluded that students also recognize the utility of new teaching methods, but their application in the classroom depends on teachers' training. Young people, being knowledgeable about technology, are also good evaluators in this field, and they appreciate that having digital competencies is very important for effectively applying modern teaching methods.

Regarding question number nine, responses are almost evenly split. Half of the respondents state that these teaching methods were sometimes used even before the COVID-19 pandemic, while the other half state that they were frequently used.

Question number eleven refers to students' own learning activities. 94% of respondents declare that they also use digital tools themselves. The main motivation behind this choice is quick access to information. The second reason is the increased efficiency of these new methods compared to traditional learning methods. These results confirm the reality. For young people, easy access to online information is well-known and depended upon. They live in a society dominated by technology and the internet, integrating elements from daily life into their school life. Among those who declared that they do not use digital tools in their learning activities, most justify their choice by stating that homework tasks do not allow the use of technology. Thus, it can be stated that, although these methods are prevalent in students' lives today, classical methods are still applied.

Another important subject addressed in the survey is the activity of evaluation. Cheating is unfair, artificially favouring certain individuals, which can create a sense of frustration among students. In question number 14, students were asked to rate how motivated they were to cheat on an evaluation when their peers did so. 44% of them stated they felt motivated or very motivated, 39% felt very little or little motivated, while 16% stated it was not applicable. These results confirm that cheating creates inequity, and to protect themselves, students sometimes resort to the same means.

When asked if digital evaluation forms are currently used, students responded affirmatively in 55% of cases and negatively in 45%. Additionally, among those who declare that these tools are still used, 76% state that they are used in less than 30% of total evaluations.

Asked if they believe digital evaluation tools reduce test cheating, 65% of student respondents agreed with this statement to a small or very small extent. Unlike teachers, they were more convinced that these tools are not more useful than traditional ones in reducing cheating. Their opinion is especially important as they are the ones using these tools and know the ways they can be circumvented.

When asked about the grades obtained during 2020-2022, most did not express a clear opinion on whether the grades accurately reflected their actual knowledge. The others were split into two categories: 33% stated that the grades reflected their knowledge to a small or very small extent, while the remaining 33% stated that the grades reflected their knowledge to a large or very large extent during the online classes.

In question number 20, respondents were asked to estimate the extent to which cheating occurs in current evaluations. Most, 35%, responded that approximately 30% of total evaluations involve cheating. 28% stated that in their class, cheating occurs in 50% of evaluations. This shows that, despite teachers' efforts to prevent such events, students manage to bypass their vigilance.

Question number 21 aimed to identify, from the students' perspective, the main method used to prevent cheating in digital evaluations during 2020-2022. Respondents stated, in 49% of cases, that teachers required them to have their video cameras and microphones turned on. This method was well-known and widely used during the mentioned period. However, as the collected responses indicate, it was not very effective, with students finding other ways to cheat. The second most mentioned method was giving

students the same subjects but distributed randomly, which was also the most mentioned method by teachers.

Asked if they ever attempted to cheat on an evaluation, student respondents were honest, with 85% answering yes and 15% no. In question number 23, most respondents stated that for digital evaluations, they cheated in over 50% of total evaluations. This indicates that digital evaluation tools can register a high degree of cheating if not used under strict conditions by the teacher.

In the next question, respondents stated that for traditional evaluations, they attempted to cheat in less than 10% of total evaluations. Thus, evaluations conducted in the classroom under the teacher's close supervision reduce the risk of cheating.

The following section consisted of rating statements on a scale from 1 to 5, where 1 means they agree with the statement to a very small extent, and 5 means they agree to a very large extent. The responses are summarized in the table below.

Table 2. Answers to statements

Statement	**1**	**2**	**3**	**4**	**5**
The COVID-19 pandemic has led to an accelerated digitization of the educational system in Romania.	11	30	49	102	73
The COVID-19 pandemic has resulted in a significant development of digital skills among teachers.	13	50	72	98	32
The COVID-19 pandemic has led to a high level of assessment fraud in the initial period due to teachers' lack of experience in using digital tools.	12	18	55	78	102
The COVID-19 pandemic has led to the integration of digital teaching tools into current activities.	11	40	70	87	57
The COVID-19 pandemic has led to the integration of digital assessment tools into current activities.	40	56	73	60	36
The COVID-19 pandemic has led to the attraction of financial resources to schools for digitization purposes.	16	46	88	78	37
The COVID-19 pandemic has led to an increased demand for digital training among teachers.	12	36	77	92	48
The COVID-19 pandemic has resulted in poorer preparation of students.	21	35	81	68	60
The COVID-19 pandemic has led to an increase in violence among students (school or online bullying, physical, verbal violence, etc.).	94	62	73	24	12

Source: Author's own representation.

These statements help formulate the conclusions of this case study from the students' perspective. Most respondents believe that the COVID-19 pandemic led to an accelerated digitalization of the educational system and to the acquisition of digital competencies by classroom teachers. Additionally, most respondents believe that evaluations conducted in the early part of the exclusively online courses suffered a high degree of cheating due to teachers' lack of experience with digital tools. Asked if the COVID-19 pandemic attracted financial resources to schools for technological equipment, most did not provide a clear response agreeing or disagreeing with this statement. This highlights that students are either unaware or uninterested in this aspect. Regarding students' preparation, half of the respondents believe that the COVID-19 pandemic led to a weaker preparation of students, but relationally, there were no changes in student behavior.

5. Conclusion

The results reveal critical insights into the impact of digital tools on teaching, learning, and evaluation in the post-pandemic educational environment. Most respondents, predominantly female, indicate a significant adoption of digital tools like PowerPoint presentations, educational platforms, and other online resources in their learning process. Despite only 6% of respondents residing in urban areas, the broad geographic distribution of students underscores the wide-reaching influence of digital education.

The pandemic has catalysed a notable shift towards digital teaching methods, with 65% of students reporting that digital tools are used in over half of their classes. However, a discrepancy exists between student and teacher perceptions, suggesting potential subjectivity in teachers' self-evaluations. While students recognize the utility of digital methods, they emphasize the importance of teachers' digital competencies in effectively leveraging these tools. This is reflected in the 81% of students who consider digital competencies crucial for their teachers.

Interestingly, only 55% of students attribute the use of digital tools to the technological infrastructure available in schools. This suggests that while infrastructure is important, the capability and willingness of teachers to integrate technology play a more significant role.

The survey also addresses the contentious issue of cheating. Despite teachers' efforts to prevent fraud, a substantial 44% of students felt motivated to cheat if their peers did, indicating a persistent challenge. Digital evaluations, although prevalent, are perceived by 65% of students as not significantly reducing cheating compared to traditional methods. This scepticism reflects students' familiarity with digital tools and their potential loopholes.

Respondents' feedback on preventive measures against cheating during digital evaluations reveals a reliance on monitoring tools like video cameras and randomized questions. However, these methods were not entirely effective, as evidenced by the high incidence of reported cheating. This suggests a need for more robust and innovative approaches to maintain academic integrity in digital settings.

The survey highlights a critical insight: despite the rapid digitalization driven by the pandemic, traditional methods still play a vital role. Students' preference for and confidence in classroom-based evaluations under direct supervision illustrates the enduring value of conventional educational practices.

In conclusion, the COVID-19 pandemic has undeniably accelerated the integration of digital tools in education, bringing both opportunities and challenges and validating the statistical hypotheses of the study. While students recognize the benefits of digital learning methods, the effectiveness of these tools largely depends on teachers' competencies and the robustness of evaluation strategies. As educational institutions continue to navigate this digital transition, balancing technological advancements with traditional practices will be key to ensuring equitable and effective learning outcomes.

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