

# Administration of the Impacts Caused by the COVID-19 Pandemic on Students of the Logistics Course in the Subject of Mathematics in the Year 2020

Lilian Marques Silva<sup>1</sup>, Eik Tenorio<sup>2</sup>, Ernestina de Lourdes Cardoso Frigelg<sup>3</sup>, Volney Mattos de Oliveira<sup>4</sup>

<sup>1</sup>FatecBarueri/ Brazil

Email: [lilian.silva6\[at\]fatec.sp.gov.br](mailto:lilian.silva6[at]fatec.sp.gov.br)

<sup>2</sup>FatecBarueri/ Brazil

Email: [eik.tenorio01\[at\]fatec.sp.gov.br](mailto:eik.tenorio01[at]fatec.sp.gov.br)

<sup>3</sup>FatecBarueri/ Brazil

Email: [ernestina.frigelg\[at\]fatec.sp.gov.br](mailto:ernestina.frigelg[at]fatec.sp.gov.br)

<sup>4</sup>FatecBarueri and FatecTatuí/Brazil

Email: [volney.oliveira\[at\]fatec.sp.gov.br](mailto:volney.oliveira[at]fatec.sp.gov.br)

**Abstract:** *People's behavior has undergone major changes due to access to information, almost instantaneous, provided by technological advances and the internet; this, also reflecting in classrooms. These new technologies have made teachers change their teaching methodologies, as well as their way of seeing the teaching-learning process. The pandemic caused by Covid-19 has shown that the insertion of electronic devices and the internet will be maintained in the daily routine. This present work aimed to present how university students from a higher education course in Logistics were influenced during the pandemic, in mid-2020, in learning the discipline of mathematics, considering the difficulties due to the lack of equipment and internet access. The methodology used for the development of this work was the case study supported by applied research for new discoveries; descriptive research to understand a given phenomenon/experience; bibliographic research to collect theoretical and technical material; field research to obtain behavioral data; and quantitative research for data analysis. The data presented showed that there was a reduction in the learning quality and in the absorption of the course content, mainly in the discipline of Mathematics.*

**Keywords:** Mathematics, Technology, Internet, Difficulty

## 1. Introduction

The great physical barriers that made social interactions difficult were broken with the development of technological advances which humanity has been going through. This digital interactive behavior ends up reflecting on the contact that the teacher and the students have in the classroom. In this work, the behavior of the Logistics course students was observed by means of field research, in a public technological college of the State of São Paulo, during the mathematics classes. Data were collected by an electronic questionnaire. The results were satisfactory, as the students were interested in the classes, even if they had difficulties due to the lack of electronic equipment and the internet. Much of this success is due to the work of the teacher, who kept students engaged and motivated.

### 1.1 Problem

Since the Educational Bill (Law n. 9.394/1996) came into force to forbid the repetition of students during the school year in the period of literacy (Art. 29), it is observed that this has had an impact on the cognitive formation of children in the years following their literacy. (BRAZIL, 1996). This difficulty lasts throughout the child's school life. Even with great debates on this subject between schools and public

authorities, there are still great disagreements until a coherent opinion is reached leading children continue to suffer the consequences on this matter. The impact goes beyond the classroom, reaches the child in hindering decisions even to solving small daily problems. This ends up causing embarrassment, low self-esteem, relationship problems; therefore, demotivation for learning and causing school dropout. Besides, parents/guardians do not observe the child's progress in relation to learning; leading them to be encouraged to stay at home to take care of their siblings or to work on the streets. However, this child becomes a teenager who aims at higher education carrying high challenges to break down the barriers of weak and outdated learning, especially in mathematics. He tries to choose a course, with a higher level, that doesn't have many math subjects because he already has the preconception that he won't do well in these subjects. All this ends up reflecting on the professionals who will be trained for the job market.

### 1.2 Justification

Children who underwent continuous approval were unable to develop their cognitive aspects satisfactorily to continue in the following grades; consequently, will have their education with continuous delay. These children have a multi-subject class teacher from 6 to 14 years old and aim to enter higher education after high school. However, training,

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mainly in the area of mathematics, comes with a great lag due to the difficulties of interpretation and elaboration/resolution of mathematical operations, often in basic questions. Upon reaching higher education, the level of demand increases, consequently, this student will have to recover the outdated content with parallel and autonomous studies; which not all people can. With the pandemic and home confinement, the difficulties for this recovery have only been exacerbated. Many people did not have equipment, such as, a mobile phone or computer to participate in classes, which until then had been taught remotely and synchronously. Based on this statement, the development of this work with studies on the impacts caused in the learning outcome of the discipline of mathematics, in university students of the logistics course, in the period of the pandemic, in 2020, is justified.

### 1.3 Purpose

The objective of the work was to present how university students from a higher education course in Logistics were influenced during the pandemic, in mid-2020, in learning about the discipline of mathematics, considering the difficulties due to the lack of equipment and internet access. This work has the purpose of an original article and can help in understanding the influence of the media in young people's lives.

### 1.4 Methodology

The specific theme for the analysis of the influence on the use of learning in mathematics, during the pandemic, in university students of a higher course in Logistics, in synchronous remote classes allowed us to apply a Case Study aiming at the gathering of detailed and systematized information about this fact (PATTON, 2002). Applied research was used in relation to the nature of the work to seek new knowledge and/or truths (GIL, 2002). Descriptive research was used to corroborate with the general objective of the work, describing the characteristics of the phenomenon or the experiences of these students (GIL, 2002). Bibliographic research was carried out to collect theoretical data related to the theme for technical procedures. Fonseca (2002) defines bibliographical research as a study carried out from the survey of theoretical references already analyzed, and published by written and electronic means, such as, books, scientific articles, website pages. Any scientific work begins with a bibliographical research, which allows the researcher to know what has already been studied on the subject. There are, however, scientific studies that are based solely on bibliographical research, looking for published theoretical references with the aim of gathering information or prior knowledge about the problem to which an answer is sought (FONSECA, 2002, p. 32). To understand the different scientific contributions available on the subject in question, books, newspapers and academic journals, manuscripts, norms and websites were read, analyzed and interpreted. Indispensable for the development of this work, laws, deliberations and resolutions issued at national, state and municipal chamber levels referring to the business area. In order to collect data regarding the difficulties experienced by the students, a field survey was carried out using an electronic questionnaire.

According to Gil (2002, p. 50), "Research of this kind is characterized by the direct questioning of people whose behavior one wishes to know". Regarding the approach, to transform data into numbers, analyzing them to draw the appropriate conclusions, quantitative analysis was used. According to Gil (2002) "[...] information is requested from a significant group of people about the problem studied, and then, by means of quantitative analysis, conclusions corresponding to the data collected are obtained."

## 2. Development

In the 1980s and 1990s, students had to seek information for the preparation of work, or even to clarify a topic addressed in the classroom, in physical libraries of schools, or the municipality, or the state, or even research in encyclopedias, newspapers and magazines. Information at the time referred to above took a certain amount of time to reach people. Physical interaction turned out to be a means of acquiring more information. From the 2000s, information via the Internet began to become popular. Access to information has become faster and easier. News starts to be instantaneous. The evolution of digital media is increasingly visible. The search for simple information is linked to internet searches. No one wants to use the memory anymore to know what the correct spelling of the word looks like, the spell checker is used, which is often not correct. The media reach influences the way of teaching and, therefore, the way of learning. The portability of mobile phones ended up generating many distractions in the classroom. It took the Governor of the State of São Paulo to create Law dated 16,567/2017 (SÃO PAULO, 2017) to forbid the use of mobile phones in the classroom; with the approval of this law, teachers were able to better control the attention of students. In the period between eighteen months and twelve years of age, human beings are in the phase considered as a child. During this period, children undergo a great physical and psychological development. Everything ends up calling their attention and the mobile phone causes great distraction and, in some cases, this harms the student in the classroom. Observing from a positivist perspective, the mobile phone can also be a means to search for information on the internet. Teachers also felt the intervention of the internet in their archaic way of teaching. For the teacher to continue to be the motivator of the students, he must update himself and "attune" (be aware of the innovations and news). New active methodologies must be used in the classroom so that students remain interested and attentive to the messages that the teacher has to convey. Electronic devices such as a projector, computer and sound system are now part of everyday life in classes that used to rely only on blackboard and chalk. This helps the student become familiarized in the classroom, holding their attention longer. The teacher now must master these technologies and control the room in a friendly way, always encouraging student success, which generates a more satisfactory class. Gil (2008) states that teachers, in addition to influencing students, end up being influenced by their behavior. Currently, the State of São Paulo is going through a time when, in most state schools, the overcrowding of classrooms ends up causing great difficulties for teachers in terms of providing attention to students. It is important that students feel familiar with the classroom environment; this will block non-academic

behavior that is incompatible with learning. Most teachers are unaware of the reality, the verbal and body language codes, in which each student lives or has. Therefore, the generalization of the assistance given to students can cause disinterest/dispersion in learning. The teacher cannot only focus attention on inappropriate behavior in the classroom; he must encourage good behavior, such as pro-activity and active participation. Medeiros et al. (1995; 2003) reported a study in which a teacher used coercive procedures for behavior considered inappropriate in the classroom, however, this behavior ended up increasing the students' disinterest in remaining in the classroom. As coercion is associated with learning, students end up associating learning with a bad feeling, something negative, painful. On the other hand, teachers who lead students by supporting success manage to have a class more interested in classes "[...] those who lead their students successfully at every step, positively reinforcing successes, instead of punishing failures, do not create dropouts; they don't give their students a reason to withdraw" (SIDMAN, 1995 apud DUPONT, 2007, p. 119). Perceiving learning as something favorable, students end up being more committed in class, looking for information to carry out their work, requesting support and participation from their parents.

**2.1 The importance of mathematics in people's lives**

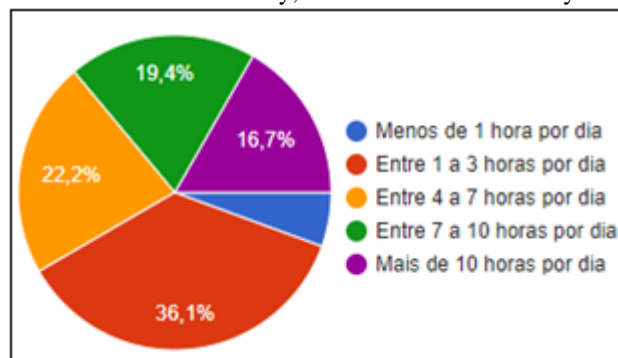
Teaching-learning in mathematics is closely linked to how the teacher works with this subject in the classroom and how this teacher develops his educational practices and methodologies. This premise is valid from the first years when the child begins to have contact with the concepts of mathematics. It is these moments that will define affinity or repulsion with this area.

To understand a mathematical concept, the individual needs to know the definition of the concept with it be able to relate it to day-to-day implications. (MATA-PEREIRA; PONTE, 2018). The preparation of students when based on logical reasoning awakens citizenship, helps in resolving problem situations that may arise by professional and family work. (BATTISTA, 2017). Mathematics is learning by symbols, signs, semiotics, which represents a situation according to reality, enabling people to solve problem situations faced in everyday life (PEIRCE, 1995).

**2.3 Survey of data related to learning difficulties**

Considering the impacts caused by the lack of electronic resources, the difficulty of accessing the internet and the cognitive difficulties in mathematics, an electronic questionnaire was created to collect data related to the practices experienced by students of the Logistics course, at the peak of the pandemic caused by Covid-19, in 2020. Aiming at this purpose, a questionnaire was sent to the students of the course, and of the 40 new entrants, 36 answered it.

The first question was: "In 2020, regarding internet access, what is the average duration of use of this service?" (Graph 1). Possible choices of answers: less than 1 hour a day; between 1 to 3 hours a day; between 4 to 7 hours a day; between 7 to 10 hours a day; more than 10 hours a day.



**Graph 1:** First question regarding internet exposure. Source: elaborated by the author (2022).

In Graph 1, it is observed that exposure for more than 10 hours was the one with the lowest percentage, 16.7%. Exposure between 1 to 3 hours had the highest percentage, 36.1%.

Likert scale was adopted to assess the levels of agreement, frequency, importance, and probability of students during contact with the mathematics subject. This scale model was used in questionnaires to find out about customer satisfaction when they got into contact with a product or service (SILVA, 2021).

**Table 1:** Relationship of the percentages of responses with the Likert scale for each survey question

		Questions									
		two	3	4	5	6	7	8	9	10	
%	<b>I totally agree</b>	80	25	2.8	2.8	19.4	5.6	2.8	44.4	36.1	
	<b>I agree</b>	10	22.2	33.3	25	66.7	27.8	19.4	47.2	52.8	
	<b>Neutral</b>	0	8.3	11.1	16.7	11.1	5.6	13.9	2.8	5.6	
	<b>I disagree</b>	0	41.7	27.8	38.9	2.8	33.3	50	0	2.8	
	<b>Totally disagree</b>	0	2.8	25	16.7	0	27.8	13.9	5.6	2.8	

Source: elaborated by the author (2022)

Subtitle

- 2- In 2020, did you have math classes in synchronous remote mode?
- 3 - In 2020, were you able to solve the exercises proposed during class synchronously?
- 4 - In 2020, did you have difficulty understanding what the teacher was saying during the synchronous class due to the

clarity in the transmission of information (teaching methodologies)?

5 - In 2020, did you have difficulty understanding what the teacher was saying during the synchronous class due to the clarity of data transmission (internet)?

6 - In 2020, did you have supporting material, such as, handouts and books, to help in understanding the content provided in the synchronous classes?

7 - In 2020, did you need to call a relative to help you use your computer/mobile phone during math classes?

8 - In 2020, did you need to call any relatives to help you understand what the teacher was saying during math classes?

9 - In 2020, did you have to review the math classes that were recorded to solve your homework?

10 - In 2020, did you watch videos on the internet to help solve the exercises?

To identify whether the student had taken the course in synchronous remote mode, the second question was asked: "In 2020, did you have mathematics classes in synchronous remote mode?". Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 2, it is observed that there is a percentage of 80% of the students who completely agree and 10% who agree, that is, these students participated in the classes in synchronous remote mode; the other 10% of the students, of the class, did not respond.

To find out if the student was able to solve the proposed exercises, the third question was asked: "In 2020, were you able to solve the proposed exercises during synchronous classes?". Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 3, it is observed that there is a percentage of 41.7% of students who disagree and 2.8% who strongly disagree.

To understand the difficulties experienced by the students regarding the teacher's teaching methodology, the fourth question was asked: "In 2020, did you have difficulty understanding what the teacher said during the synchronous class due to the clarity in the transmission of information (teaching methodology)?" Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 4, it is observed that there is a percentage of 33.3% of students who agree and 2.8% who completely agree.

The fifth question addressed the issue of data transmission via the Internet. The question was: "In 2020, did you have difficulty understanding what the teacher was saying during the synchronous class due to the clarity of data transmission (internet)?" Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 5, it is observed that there is a percentage of 38.9% of students who disagree and 2.8% who completely agree.

To check whether the Freshmen had access to support material, the sixth question was asked: "In 2020, did you have supporting material, such as, handouts and books, to help in the understanding of the content provided in the synchronous classes?" Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 6, it is observed that there is a percentage of 66.7% of students who agree and 2.8% who disagree.

To assess whether students needed help from family members to deal with technology, the seventh question was

asked: "In 2020, did you need to call a relative to help you use the computer/mobile phone during math classes?". Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 7, it is observed that there is a percentage of 33.3% of students who agree and 5.6% who completely disagree.

To assess whether students needed help from family members to listen to the teacher, the eighth question was asked: "In 2020, did you need to call a relative to help you understand what the teacher was talking about during math classes?". Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 8, it is observed that there is a percentage of 50% of students who disagree and 2.8% totally agree.

To assess whether students were able to follow and understand the content synchronously, the ninth question was asked: "In 2020, did you have to review the recorded math classes to solve your homework?". Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 9, it is observed that there is a percentage of 47.2% of students who agree and 2.8% who were neutral.

To assess whether students needed support videos, the tenth question was asked: "In 2020, did you watch videos on the internet to help solve exercises?". Possible choices of answers: I totally agree; I agree; Neutral; I disagree; I totally disagree. In Table 1, in question 10, it is observed that there is a percentage of 52.8% of students who agree and 2.8% who disagree.

### 3. Final Considerations

To prevent people from continuing to believe that mathematics is a "bogeyman", it is extremely important that teaching professionals arouse in children the desire to learn mathematics, for this, the use of new technologies and new teaching methodologies are needed. This work aimed to present how university students from a higher education course in Logistics were influenced during the pandemic, in mid-2020, in learning about the discipline of mathematics, considering the difficulties due to the lack of equipment and internet access. The methodology used for the development of this work was the case study, supported by applied research, descriptive research, bibliographical research, field research and quantitative research.

Possibly, this exposure to the internet for more than 10 hours could influence the psychological conditions of the students, due to the large amount of advertisements, and, perhaps, could be a reflection of a search for a professional placement. The exposure between 1 to 3 hours could reflect the students' daily lives, taking into account the 8 hours of the workday.

Considering the percentage of responses presented in Table 1, for questions 2 to 10, there are some notes. With regard to having attended the course in synchronous remote mode, it appears that the adopted method was accessible to 90% of the class. It is observed that 40% of the students were unable to solve the exercises proposed during the synchronous



classes. It is noted that more than 30% of the students had difficulties in understanding what the teacher was saying during the synchronous class about teaching methodologies. It was found that more than 30% of the students did not experience difficulties in understanding what the teacher was saying during the synchronous class regarding data transmission (internet). Around 60% of the students state that they had access to the supporting material provided by the teacher, to help the understanding of the content provided in the synchronous classes. Approximately 30% of the students did not need help from a relative to use the computer/mobile phone during classes. However, 5.6% of students say they needed some help from a relative during classes. More than 50% of students did not need help from a relative to understand what the teacher was talking about during class. Over 40% of students had to review recorded math lessons to solve homework. 50% or more of students say they had to watch videos on the internet to help with solving the exercises.

The data presented showed that there was a reduction in the quality and use of teaching with this synchronous remote methodology, *online*, mainly in the Mathematics discipline.

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