

# Remote Education at School: an analysis of the difficulties of Mathematics teachers<sup>1</sup>

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## ABSTRACT

In view of the adversities of education during the COVID-19 pandemic, this article seeks to analyze and highlight the difficulties encountered by mathematics teachers when exercising remote teaching during this period. In this qualitative and descriptive study, 18 teachers from public and private schools participated. Data were collected through an electronic questionnaire and discussed with Bardin's content analysis, from which four categories of difficulties emerged: I – Difficulties in skills for the use of technologies; II – Infrastructure difficulties for remote learning: internet access, software and equipment; III – Difficulties related to students: lack of face-to-face pedagogical service, low attendance and lack of interest; IV – Difficulties related to teachers: adaptation to remote work and increased workload. Such difficulties highlight the need for digital literacy of teachers through continuing education as well as the need for infrastructure investments in public schools.

**KEYWORDS:** Remote Teaching. Pandemic. Education. Mathematical.

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*Ensino remoto na escola: análise das dificuldades de professores de matemática*

**RESUMO**

Tendo em vista as adversidades da educação durante a pandemia de COVID-19, este artigo busca analisar e evidenciar as dificuldades encontradas por professores de matemática ao exercerem o ensino remoto durante esse período. Neste estudo, de cunho qualitativo e descritivo, participaram 18 professores de escolas públicas e privadas. Os dados foram coletados por meio de questionário eletrônico e discutidos com a análise de conteúdo de Bardin, da qual emergiram quatro categorias de dificuldades: I – Dificuldades em habilidades para o uso de tecnologias; II – Dificuldades de infraestrutura para o ensino remoto: acesso à internet, softwares e equipamentos; III – Dificuldades relacionadas aos alunos: falta de atendimento pedagógico presencial, pouca frequência e desinteresse; IV – Dificuldades relacionadas aos professores: adaptação ao trabalho remoto e aumento da carga laboral. Tais dificuldades evidenciam a necessidade de letramento digital dos docentes por meio de formação continuada como a necessidade de investimentos de infraestrutura nas escolas públicas.

**PALAVRAS-CHAVE:** Ensino Remoto. Pandemia. Educação. Matemática.

*Educación a distancia en la escuela: análisis de las dificultades de los profesores de matemáticas*

**RESUMEN**

Ante las adversidades de la educación durante la pandemia COVID-19, este artículo busca analizar y resaltar las dificultades encontradas por los docentes de matemáticas al ejercer la enseñanza a distancia durante este período. En este estudio cualitativo y descriptivo participaron 18 docentes de escuelas públicas y privadas. Los datos fueron recolectados a través de un cuestionario electrónico y discutidos con el análisis de contenido de Bardin, del cual surgieron cuatro categorías de dificultades: I - Dificultades en las habilidades para el uso de tecnologías; II - Dificultades de infraestructura para el aprendizaje a distancia: acceso a Internet, software y equipos; III - Dificultades relacionadas con los estudiantes: falta de servicio pedagógico presencial, baja asistencia y desinterés; IV - Dificultades relacionadas con el profesorado:

adaptación al trabajo a distancia y aumento de la carga de trabajo. Tales dificultades resaltan la necesidad de alfabetización digital de los maestros a través de la educación continua, así como la necesidad de inversiones en infraestructura en las escuelas públicas.

**PALABRAS CLAVE:** Enseñanza remota. Pandemia. Educación. Matemáticas.

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## Introduction

The teaching of Mathematics has always been intertwined to factors which are inherent to the usage of methodological tendencies, to the initial and continuing education, to the usage of technology in favor of the pedagogical process in the classroom, among others. The sudden arrival of the pandemic brought with it the need of social distancing, being that the advent of remote teaching became a reality in Brazilian schools. In this context, the teachers saw themselves obliged in a short time to see their habitual in person classes being turned into digital meeting platforms such as Google Meet and Zoom. The blackboard was replaced by slides and digitizing tables and the online tests became adopted in an ordinary way in the daily school routine.

This whirlwind of changes carried many meetings and disagreements of the Mathematics teachers in what concerns the pedagogical development of their daily work, because the transformations were so many and the period for them to occur was too little. Flores and Lima (2021, p. 95) pay attention that for this moment “the force of the circumstances propelled a change developed without the adequate reflection, formation and preparation, submitting the teachers to adaptations in their practices”. Under the same scope, Vasconcelos and Araújo (2020, p. 03) inquire “how will the teachers take care of this new reality if they do not have essential competences to validate the

practice?”. Summed to this context of adaptations and essential competences that passed to be mandatory to the teachers, we cannot forget the precariousness of infrastructure in Brazilian public schools pointed by Silva and Souza (2013) who deflagrate some concerns about the quality of externalized teaching with the low indexes of performance in evaluations of national character and which may still be aggravated in the pandemic period with the remote education.

In view of this, we understand as necessary for the ends of comprehension of the current situation of remote education, to give voice to the Mathematics teachers so they report their difficulties lived in their daily work routine during the COVID-19 pandemic. In this way, our objective was to analyze and highlight the difficulties found by Mathematics teachers when exercising the remote education and also search to point what could be taken as an action in a way to improve this process.

Beyond this introduction, this research is subdivided in five sections. In the next section we discuss theoretically about this moment of pandemic and the mishaps in the teachers' lives. In the third section we present the methodological procedures of the research. In the fourth and fifth sections, we present respectively, the characterization and formation of the researched teachers and the data analysis developed under the light of the assumption of the Analysis of Content by Bardin (2011), ending with the section of final considerations.

## **Theoretical Reference**

It is understood that the teaching realized by teachers of the most diverse subjects and, in special, of Mathematics, is a complex process with diverse factors that can interfere in the learning of students. Beyond this, to summarize the work of teachers to “just” teach needs to be rethought. Oliveira et al. (2012) highlight that:

There is so much to do that simply fulfill what is specified demands almost all the efforts of the teacher, executing an intense quantity of tasks that most of the times was not elaborated or decided by him, not existing time to think and discuss these tasks. (Oliveira et al., 2012, p. 14)

In this way, the teaching process turns to be each time more complex and laborious to the teacher. With emphasis, before the pandemic we already had reports over the precariousness of schools in Brazil, which presented lack of material, of infrastructure, of personnel, among others, according to what is pointed by Silva and Souza (2013, p. 784) when comment that “[...] it is necessary to show the Brazilian society the precarious conditions that still persist in public educational institutions, their relations with the quality of education and with the low results obtained in national evaluations”. In view of all this scenario that the teachers had been and still are passing, in 2019 occurred the COVID-19 pandemic, which brought a new meaning to the act of teaching and learning.

The classes shifted from in person to the remote education, the usage of the blackboard and chalk was replaced by digital technology such as digitizing tables, the activities before planned for the in person work with students had to be adapted, among many other changes. However, diverse teachers were not formed for this kind of teaching with the usage of digital technology. Santos, Pessanha and Silva (2016, p. 5) already stressed the importance of also taking into consideration this:

[...] adequate usage of the new educational technology, we need teachers well formed, that are able to develop na educational practice that enable the learning in all aspects favoring autonomy and proximity of the student and making it possible a significant formation for the subjects that aim to elevate their schooling and even to improve their social condition (SANTOS; PESSANHA; SILVA, 2016, p. 5).

In spite of understanding the this importance of the relation teacher-digital technology, we evidence that diverse teachers had to develop na adapted teaching process, in which they and the students learn together and look for better alternatives to favor the Best learning, as it was already highlighted by the authors. Notwithstanding, other factors also appeared in this new teaching modality. Cordeiro (2020, p.12) acknowledges in a study “[...] that many schools face the challenge of connectivity, there is still a huge heterogeneity in the access to technological resources between social classes and many teachers do not possess specific formation to deal pedagogically with the technological resources”.

For Cao et al. (2021, p. 09, our translation), with the advent of remote classes due to the Covid-19 pandemic, the teachers felt “oppressed by being exposed to a big number of digital pedagogical resources”. According to the authors, the teachers suddenly had diverse pedagogical options of different materials in many forms, which included class plans, recorded video classes and slide presentations. Due to the lack of experience, the teachers felt difficulties to decide which digital resource would be more adequate to the context of online classes.

Consequently, the obstacles of remote education also reflected on the students. An example is the study of Mereles, Canese and Amarilla (2021) which, in the scope of the difficulties faced by the highschool and college students in Paraguay, showed:

[...] the lack of comprehension of the tasks attributed by the teachers, the lack of motivation, internet connection problems, lack of support to learning, lack of Access to information to realize tasks, lack of knowledge in the usage of technological tools, little access to technology, among others (MERELES; CANESE; AMARILLA, 2021, p. 15, our translation).

All these factors corroborate to make the teaching each time more complex and challenging to the teachers, once, according to the study of Santos (2020, p. 55), they have concerns about “[...] the form which they should develop the content; orality; demonstration; fixation and magnification; how to ensure this learning to the student, without being able to achieve all these mechanisms”. When we think that remote education presented itself as something new to the teachers, we understand the insecurity that many have in relation to fulfilling their role in the best way.

Besides this, we also perceive that there is a difference when teaching remotely and in person, because the interaction between students and teachers decrease (ANJOS, 2020), once in the videoconference platforms as *Google Meet* and *Zoom*, hardly the students open the cameras to speak with the teachers. The process of evaluation also changed, since the forms, in the style of electronic questionnaires, had to be part of the teachers’ routines (SANTOS; ROSA; SOUZA, 2020).

In greater deepness, Rondini, Pedro and Duarte (2020, p. 53) stress that besides the teachers had to deal with these diverse difficulties, they also have to support the students, once “[...] in the context of the crisis, factors which are not related only to the matter of program content or to the criteria and methodology of the evaluative process evolve, because they encompass social, familiar and economic matters of the students”. In agreement, Anjos’ study (2020, p. 44) highlights that many students “[...] do not have access to the technology what made the participation decline drastically, affecting negatively the construction of knowledge, interest and motivation”.

Facing this scenario, we see diverse cases of teachers that besides elaborating the class for the remote education also have to think in manners to make available the material to the students that cannot watch these classes. Santos, Rosa and Souza (2020, p. 183) stress this scenario as “the great challenge that have been for these teachers to teach Mathematics in the current pandemic scenario, what intensifies even more their daily fight for better work conditions and professional

appreciation”. This appreciation must also come from society, once fathers and mothers, that had to play a role of tutors of their children, helping them in the activities, lived the difficulty that is the act of teaching.

From these pinpointed reflections, we evidence that the educational situation of Brazil, both from infrastructure as well as qualification through national and international rankings of learning, before the pandemic, already was unfavorable and that, during the pandemic, diverse new obstacles appeared. In this way, we understand the importance of observing which were these difficulties, under the scope of teachers, so new strategies may be put in practice, with the objective of collaborating with qualitative teaching and learning.

## **Methodology**

This is a research of qualitative nature, because it seeks the presentation, the treatment and the understanding of social contexts (SOUZA; KERBAUY, 2017). Beyond it, it is of descriptive character, because “it has primordial objective the description of characteristics of determined population or phenomenon or the establishment of relations among variables” (GIL, 2008, p. 28).

In this manner, the researched subjects were 18 Mathematics teachers from the final years of Elementary School and from High school. Between the researched 14 acted only in public schools, 1 (one) only in private school and three acted concurrently in public and private schools. The object of study were the difficulties found by the teachers with the remote education during the coronavirus pandemic in the year of 2020.

To contextualize, in relation to remote education in the public education network, the State of Paraná initially adopted in the month of March of 2020, the usage of asynchronous lessons recorded in studios and made available to the students through the TV and YouTube. The control of classes and activities were done in a remote manner by the teachers through



the platform *Google Classroom*. The students also had access to links, evaluative activities and grades through this platform. Besides this, they also were able to contact their teacher to answer their questions.

The SEED-PR – State Secretary of Education of the State of Paraná was the responsible of posting weekly the asynchronous classes jointly to the activities suggested according to the number of classes of each year/grade of each subject, falling to the teachers to follow the development of the activities done by the students, answering questions, adding extra material, assigning frequencies and grades, verifying the students which did not do the activities and communicating the pedagogical team of the school when necessary. In the month of October of the current year, it was implemented that the teachers should do synchronous weekly classes of 15 to 30 minutes per group of students through *Google Meet*.

In relation to the private education network, most adopted, since the beginning of the pandemic in March of 2020, the remote synchronous classes with video calls and using different private educational platforms for pedagogical activities of teaching and learning.

Inside this panorama, starting from the assumption that there could be difficulties found, we search in this study to evidence them by mean of the view of teachers that took part in this process. To achieve our objective, due to the pandemic moment and for believing in this as a safer mean, we used the electronic questionnaire– *Google Forms* – containing open and closed questions. The link for this questionnaire was sent to WhatsApp and Facebook groups as well as e-mail lists of Mathematics teachers. The questions were made available between the days 1<sup>st</sup> and 30<sup>th</sup> of November of 2020 so the teachers could answer them.

In relation to the questions asked in the form, there were divided in 3 sections, to know: I) General Data; II) Initial and Continued Formation for the Remote Teaching and Distance Education and III) The process of teaching and learning Mathematics during the COVID-19 pandemic. The following table 1 describes the questions raised with the teachers.

**TABLE 1 – Guide of the form sent to the teachers**

<p><b>General Data</b></p> <p>1 - Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female</p> <p>2 - City/State: _____</p> <p>3 – Academic formation:</p> <p><input type="checkbox"/> Degree Student in Mathematics <input type="checkbox"/> Graduate <input type="checkbox"/> Master’s degree <input type="checkbox"/> Doctorate degree</p> <p>4 – For how long have you been teaching Mathematics?</p> <p><input type="checkbox"/> 1 to 5 years. <input type="checkbox"/> 6 to 10 years. <input type="checkbox"/> 11 to 15 years. <input type="checkbox"/> More than 15 years.</p> <p>5 - Local(s) where you teach during the COVID-19 pandemic:</p> <p><input type="checkbox"/> Public School. <input type="checkbox"/> Private School. <input type="checkbox"/> Public College.</p> <p><input type="checkbox"/> Private College.</p>
<p><b>Initial and Continued Formation for the Remote Education</b></p> <p>6 – In your initial formation, how do you evaluate your formation for the usage of technology in the remote teaching of the subject of Mathematics?</p> <p>Bad <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 Great</p> <p>7 – In relation to your continued formation, how do you evaluate this formation for the usage of technology in the remote teaching of the subject of Mathematics?</p> <p>Bad <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 Great</p> <p>8 – How do you evaluate your skill for the usage of technology in the remote teaching of the subject of Mathematics? _____</p>
<p><b>The teaching and learning process of Mathematics during the COVID-19 pandemic</b></p> <p>9 – Which are the POSITIVE points of teaching Mathematics in a remote manner for you? _____</p> <p>10 – Do you prefer teaching Mathematics classes in a form:</p> <p><input type="checkbox"/> Remote</p> <p><input type="checkbox"/> In person</p> <p>11- Which are the NEGATIVE points in the processo f teaching Mathematics in a remote manner? _____</p>

**Source:** Elaborated by the authors

Firstly, we present a section about the characterization and formation that the teachers reported in the questionnaire, quantifying their answers, in a way that related to the objective questions (questions 6 and 7), we used the Likert scale. Then, the *corpus* of our research was presented, according to the analysis realized.

In relation to the open questions (questions 8 and 11) we used the Bardin’s Analysis of Content (2011) and did the categorization *a posteriori*,

what is, with the categories emerging according to the raised data. Bardin (2011) describes such process in three phases:

- a) Pre-analysis: when the researcher chooses the data that will be placed under analysis, which in this research refer to the answers of the teachers to the open questions 8 and 11. Therefore, the material was organized, being done a floating reading over the *corpus*, observed the rules of exhaustiveness, representativeness, homogeneity and pertinence.
- b) Exploration of the Material: This second phase is that in which are administered the decisions to be taken and the manipulation of codification occurs, in other words, when the data are treated.
- c) Treatment of the results, inferences and interpretation: it is the final phase where is given the significance of the obtained results, occurring the process of inference about the data under the light of the adopted theoretical references.

### Characterization and formation of teachers

The present research counted with the participation of 18 Mathematics teachers that made the return of the form that was sent. All the participant teachers were residents of the State of Paraná. The questions 1 to 5 of the section General Data allowed us to profile these teachers. The following Table 2 shows the profile of the teachers who answered the questionnaire.

**TABLE 2** – Profile of the teachers who answered the form.

Gender	Academic Formation	Time teaching	Local(s) where taught in the pandemic
<i>Female: 72,2%</i>	<i>Student: 0%</i>	<i>1 to 5 years: 5.6%</i>	<i>Public School: 94.4%</i>
<i>Male: 27,8%</i>	<i>Graduate: 5.6%</i>	<i>6 to 10 years: 16.7%</i>	<i>Private School: 22.2%</i>
	<i>Specialization: 61%</i>	<i>11 to 15 years: 27.7%</i>	<i>Public College: 0%</i>
	<i>Master's: 27.8%</i>	<i>More than 15 years: 50%</i>	<i>Private College: 0%</i>
	<i>Doctorate: 5.6%</i>		

**Source:** Elaborated by the authors

In Table 2, we are able to observe that most of the interviewed were of the female gender (72.2%), they were post graduated (61%), taught for

more than 15 years (50%) and worked in public schools during the pandemic (94.4%). Therefore, the section Initial and Continued Formation for the Remote Education and Distance Education – EAD, we analyzed the questions 6 and 7 using the Likert scale, which the results can be put in evidence in the following Table 3.

**TABLE 3** – Agreement of the teachers in relation to the initial and continued formation for the usage of technology in remote education.

<b>In your initial formation how do you evaluate your formation for the usage of technology in remote education of the subject of Mathematics?</b>					
<i>Level of agreement</i>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<i>Percentage</i>	22.2%	22.2%	38.9%	16.7%	0%

  

<b>In relation to your continued formation, how do you evaluate this formation for the usage of technology in the remote teaching of the subject of Mathematics?</b>					
<i>Level of Agreement</i>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<i>Percentage</i>	11.1%	22.2%	16.7%	44.4%	5.6%

Source: Elaborated by the authors

In Table 3, we observe that most of the teachers assign a level of agreement of 3 (38.9%) when they evaluated their initial formation for the usage of technology in remote education and distance education. We also found a weighted average 3 for all levels of agreement. When we dealt with continued formation, most pointed the agreement level of 4 (44.4%) with weighted average 3.7 for all levels of agreement. Such data showed a regular evaluation in the view of the teachers when the subject is the preparation they had in their initial and continued formations in order to minister their remote lessons using technological media.

In relation to question 9, about the positive points observed by the teachers in the teaching of Mathematics in the remote mode, the teacher P03 highlights the possibility of the students studying in their own time and watch the same class many times:

(1) **P03:** To reach students who have different times. For example, there are some who watch the videos more than once, come back, take notes, what would not be viable in person.

The teachers also pointed that the learning that they had got in what concerns technological tools and for verifying how useful those are to be worked in the classroom:

(2) **P05:** We have to see that the new technologies need to be learned and worked with more frequency in the classroom, once our students already know a lot of it.

(3) **P08:** I learned new Technologies and forms of teaching.

(4) **P13:** Learning about the usage of some tools.

Finally, P04 highlights the ease of using online tests that can be automatically corrected and P07 stresses the satisfaction of being able to know and apply games and apps that were never used in class before:

(5) **P04:** Online tests are life!!!

(6) **P07:** Being able to use so many games and apps that I never had used before.

However, when asked in question 10 about the preferred form of teaching their classes, 83.3% preferred the in person mode and 16.7% the remote mode. This result is an indicative that shows us that difficulties occurred with those teachers when they saw themselves obliged to adopt the remote mode and having to use Technologies during the period of the Covid-19 pandemic.

## Results and discussion

Having in view this characterization and how the teachers pinpoint about the formation they had in the usage of remote education Technologies, we proposed to analyze their difficulties, in a way causing the emergence of four difficulty categories *a posteriori*, to be known: a) Difficulties in skills for the usage of technology; b) Difficulties of infrastructure for remote education; c) Difficulties related to the students; d) Difficulties related to the teachers.

## Difficulties in skills for the usage of technology

In this category, the teachers exposed their experiences in relation to their skills to work with the technology during the remote education. The following Table 4 emphasizes their main statements.

**TABLE 4 – Difficulties in skills for the usage of technology**

Subcategory	Teachers' statements
Without difficulties in skills	P07 – Good, but I need more formation. I lack the knowledge of using the Classroom. P10 – Basic skills, acquired along the profession and perfected by my own initiative.
With difficulties in skills	P02 - Precarious. P05 – I needed to learn lots of new thing in a sudden way, it was difficult. P12 - [...] having to learn to use the difital platforms was very difficult to me. P18 – I still consider it very difficult. I still could not understand very well.

**Source:** Elaborated by the authors

In Table 4, we find the teachers P07 and P10 considering as having basic and good skills for the usage of technology. However, P07 claims to need more formation, above all due to the “lack of knowledge of using the Classroom”, while P10 says that the skills were “perfected by my own initiative”. On the other hand, it is possible to verify the difficulties faced by the teachers P02, P05, P12 and P18 claiming the precariousness of their skills in relation to the usage of technology and complaining of the little time they had to learn how to use tools and digital platforms that were adopted in the remote education during the pandemic period. Corroborating such idea, Irfan *et al.* (2020) in their study also verified difficulties of skills of teachers related to the use of technology, overall in online platforms, a fact that limited the classes od those teachers and the presentation of materials using *PowerPoint* and text reading.

This panorama meets the research by Sturion et al. (2018, p. 16) who found the “lack of knowledge of many teachers in working with the media technology and digital resources”. Such fact, for Santos, Pessanha and Silva (2016), concerns the need of improvement in the teachers’ formation for the use of these Technologies ensuring then a school environment in which the teaching practice favors a significant learning by the students in a way to increase their schooling.

### Difficulties of infrastructure for remote education

The difficulties of infrastructure for remote education had pinpoints in two branches: the first related to Access to internet and the second about software and equipments. The Table 5 below shows us the dimension of such difficulties in the view of the teachers:

**TABLE 5** – Difficulties of infrastructure for remote education

Subcategory	Teachers’s statements
Access to internet	P02 – The students do not have internet to study, so they have activities being printed. P10 - The internet oscilates to much. P11 - [...] bad internet. P14 – The absence of internet and resources for the students.
With software and equipamnts	P03 – The accessibility of apps and softwares that cannot be used at school due to lack of structure. P05 – Insufficient technological tools do not meet the real needs. P09 – The public institutions do not provide necessary equipment for the online classes. P12 - [Making] Personal investment in technology (new computer, better internet, ear phones, comfortable chair). P18 – Lack of equipment.

Source: Elabotated by the authors

It is possible to verify that P02 and P04 indicate the lack of Access to internet for the students, at the same time in which P10 and P11 mention the low signal quality of the internet provider they use. In the same way, , Sabaruddin, Marzuk and Khairunnisak (2020) also cite in

their work the difficulties of students, such as to obtain internet network in remote areas and the high cost to pay for it, what makes it difficult to follow the online classes. About this context, Almanthari, Malina and Bruce (2020), by finding similar difficulties with students from Indonesia, suggested as an alternative the supply of vouchers to the students for internet connection.

In this panorama of difficulties of infrastructure, the teacher P03 points to situations experienced in which apps and software cannot be used due to the absence of structure of the school, a note which is corroborated by the answers of P09 and P18 who confirm the lack of equipment in the institutions where they work. Finally, the teacher P05 denounces the fact of the technological tools being insufficient and do not meet the real pedagogical needs. Besides this, it is verified that P12 stresses the need of make personal investments for the purchase of equipment for daily usage in remote work.

This context references the studies by Sturion et al. (2018), Cordeiro (2020), Moreira (2020) and Sabaruddin, Marzuk and Khairunnisak (2020) who also found precariousness to access the internet, equipments, apps and software observed both by teachers and students, indicating then the need for public politics to invest in the technological infrastructure of Brazilian schools.

### **Difficulties related to the students**

The category of difficulties related to the students revealed two main forms of anguish for the teachers, to know: a) the lack of in person pedagogical support and b) lack of frequency allied to the disinterest of the students during the remote classes. Table 6 shows us the reports of these teachers in relation to such difficulties.



**TABLE 6** – Difficulties related to the students.

Subcategory	Teachers's statements
Lack of in person pedagogical support	P02 – Lack of contact with the student, in person it is already difficult, you can imagine at a distance. P03 – You having direct contact with the student and aiding in a necessary way. [...] In havin access to the students. P06 – Difficulty following the development of the activities by the students and the impossibility of better guiding them during the process. P09 – In remote form there is no way to know if the students are understanding the content, lack of group activities, lack of interaction. P11 – Lack of individual assistance. P14 – [...] the lost of a bond.
Lack of frequency and disinterest of the students	P01 – [Lack of] Participation of the students, low access P08 – [...] There is yet the question of awakening the interest of the students with the classes. P09 – Few students participating. P12 – Lack of interest of the students. P16 – Lack of attention of the students. [...] Elaborating activities that manage to meet the learning necessities of the students even because most ignore them. P17 – The realization of activities done without scientific knowledge studied, simply to answer the roll call, little effort realized.

Source: Elaborated by the authors

It is important to emphasize the moment of apprehension lived by the teachers in relation to the lack of in person support, summarized in the answer of P09 – “there is no way to know if the students are understanding the content, lack of group activities, lack of interaction”. A similar context is seen by Cao et al. (2021) when pointed in their work about remote education in China during the pandemic, in which they describe problems of teacher-student interaction and the incapacity of monitoring the participation of the students during the classes. In Board 4 above, we found that the teachers P1, P08, P09, P12, P16 and P17 stressed the lack of participation and disinterest of the students during the classes in the modality of remote education in the State of Paraná.

Over this case of disinterest, Wijaya (2021, p. 12, our translation), when researching about the difficulties noted by the parents of Chinese students related to remote education, verified that these parents “needed to

pay total attention to their children when watching the video lessons. Because there were moments in which the students just finished the video lesson and picked the notebook or the cell phone to play”. Looking to contour this situation, Daniel (2020) notes that according to researchers, the ideal time of a video lesson should extend from 5 to 10 minutes, so the students do not consider the video “boring” or have interest in see the next video lessons, avoiding then the case of dismay and abandonment of remote classes.

In our study, this scenario of difficulties in the remote education was noted by the teachers, revealing the same motive: the low frequency of the students in the classes via *Google Meet* implemented by SEED-PR since the month of October of 2020. This low frequency of presence of the students in remote classes was also identified in the study by Proença, Mendes and Oliveira (2021), according to the view of undergraduates in Mathematics who realized the supervised internship by mean of remote education in a school under jurisdiction of SEED-PR.

The difficulties listed also were identified in the work of Anjos (2020) who verified the decrease in the interaction between teachers and students, what caused difficulties in the teaching and learning process. Mendes, Luz and Pereira (2021), by researching the difficulties listed by High school students, indicated dissatisfaction of the students due to the lack of clarification of doubts and the impossibility of fast communication with the teacher because of the remote education.

Such obstacles, disinterest, low frequency and lack of engagement from students were also observed in the work of Flores and Lima (2021). What makes all this context even more worrying is that Cury (2020) in a study indicated that the teachers do not feel prepared to contour these impediments found and, in a certain way, did not glimpse alternatives to reverse these difficult situations lived by them during the remote classes.

## Difficulties related to the teachers

Lastly, the category of difficulties related to the teachers indicated difficulties in adaptation to the remote teaching and the increasing of workload of the teachers. Table 7 below sheds light to this context.

**TABLE 7** – Difficulties related to the teachers.

Subcategory	Teachers' Statements
Adaptation to remote work	P04 - Adaptation. P10 - Adapting, problem solving, such as equation and geometry, in the Google program or PowerPoint. P11 – Lack of hability to Express myself, I solved this difficulty with a digitizing table. showwww! P14 – Having to learn to use technologies. P18 – I feel difficulty in evaluating my student, I think personal contact shows us if the student understood or not the content [...] Difficulty in explaining some content, without resolving it and showing it to him step by step. As much as I show a resolved exercize I have the impression that he did not understand.
Increase in workload	P08 – [...] we need to learn to organize and to work in this way and it is much more difficult and laborious. P09 – Work overload in relation to in person education. P11 – [...] triplicate work (ex. Preparing a video lesson, slides, printed activities, among others). P15 – Dedication time even larger for the teacher. P17 – It has generated lots of work demands. We have to rescue the students who do not possess sufficient resources to do the online activities or even interest by one's part to concretize the activities.

Source: Elaborated by the authors

We verified that the teachers emphasized the difficulties to adapt to pedagogical processes of teaching and learning that involved the new reality of remote education. In relation to the teaching of Mathematics, such adaptations involved the difficulties to work with problem solving and geometry as pointed by P10; the difficulty to express oneself that was solved by P11 by using a digitizing table; in learning the technologies as stressed by P18. In treating about the increase in workload, many teachers indicated the necessity of more time to prepare their lessons and the pedagogical support to students for different reasons.

About this panorama, we return to the thoughts of Oliveira et al. (2012) who opens our eyes to the fact that the teacher's work is not only in the act of teaching, but in a series of factors which do not depend only on him, having in sight the necessity of preparing lessons, support to parents and students, school bureaucracies etc. Thus, Board 5 shows two relevant facts observed by the researched teachers and which are related to the unexpected advent of remote education caused by the coronavirus pandemic:

a) The need of adapting to remote work: fact already evidenced by Cao et al. (2021) and by Vasconcelos and Araújo (2020). The last ones emphasized that "It is also important to consider that some professionals of education are looking for, in this moment, reinventing their practice, learning new strategies that, certainly, will contribute in an effective way when the in person activities return" (VASCONCELOS; ARAÚJO, 2020, p. 07).

b) The increase in workload: this difficulty was mentioned many times by the teachers and, in the same way, Vasconcelos and Araújo (2020, p. 07) complemented about this note: "It is worthy to highlight that the workload many times has been extrapolated in relation to the time of actuation in the classroom, causing stress and overload to the teacher's work, what can compromise the performance of this professional".

The two aforesaid facts lead us to question if the teachers are having a satisfactory quality of teaching in their classes, in view of the short time for adaptation summed to the increase in workload, what makes the pedagogical work of the teacher being exhaustive, as well as it makes it difficult the success of the methodological approach of the class, which now occurs in a virtual form.

## **Final considerations**

This work searched to analyze and highlight the difficulties found by the Mathematics teachers by exercising the remote education, during the COVID-19 pandemic. The 18 teachers who took part in the research answered an online questionnaire about this form of teaching.

By mean of the four categories of difficulty that emerged, we verified the lack of Access to internet and substantialized with equipment and app insufficiency to be used in remote education, affecting students and teachers.

In what concerns to the teacher, we noticed the lack of skills in the use of technology and the need of adaptation and the increase of workload that, consequently, puts in a dubious situation the promotion of the quality of the teaching learning process in the classroom, that in a short time became virtual. Other than that, this also ended reflecting in the students, once the teachers indicated that the remote classroom made it difficult to provide pedagogical support to the students, in a process that culminated yet with the low frequency and the disinterest of these students by the classes via *Google Meet* which were implemented since October of 2020.

In face of this results, our study contributes to highlight the necessity of formation of teachers for the usage of technology, not only due to this context of remote education, but still because in some form we revealed that it is urgent for the teachers to learn how to use technology. This fact is sustained because we show that 83.3% of the researched teachers preferred the in person teaching and as well because the study by Mendes, Luz and Pereira (2021) pinpointed that 94.4% of the students of High School also preferred in person education.

Therefore, we understand that is necessary the realization of researches that offer formation in technology for education to the teachers, in other words, , “public actions oriented to the promotion of digital literacy of teachers since teacher training, conducting to the resizing of the underlying epistemology to the teaching practices facing digital technologies” (FLORES; LIMA, 2021, p. 109) are needed.

In this scenario, the Mathematics teachers must receive more pedagogical support for the remote education. Such support must allow the inclusion of knowledge about the usage of technological tools, about how to integrate technologies with teaching practices and how to deal with whatever

potential problems that may unexpectedly appear along the remote class (CAO et al., 2021, p. 10, our translation).

Thus, we see that the pandemic period brought to education a digital scenario in which we can glimpse opportunities of pedagogical and institutional construction and, in addition, so we can reflect about what can be availed for the post-pandemic legacy. For this to happen, the pedagogical support, the investment in initial and continued formation and in the infrastructure of the public educational institutions are fundamental priorities.

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