

THE USE OF DIGITAL INFORMATION AND COMMUNICATION
TECHNOLOGIES (TDIC) IN PUBLIC SCHOOLS IN THE MUNICIPALITY OF
COARI-AM

*O USO DAS TECNOLOGIAS DIGITAIS DE INFORMAÇÃO E COMUNICAÇÃO (TDIC)
EM ESCOLAS PÚBLICAS DO MUNICÍPIO DE COARI-AM*

*EL USO DE LAS TECNOLOGÍAS DE LA INFORMACIÓN Y COMUNICACIÓN
DIGITAL (TDIC) EN LAS ESCUELAS PÚBLICAS DEL MUNICIPIO DE COARI-AM*



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ABSTRACT: This work is the result of a research project aimed at analyzing the use of Digital Information and Communication Technologies (DIT) as a pedagogical strategy in the Biology discipline during emergency remote teaching in the context of the COVID-19 pandemic in schools within the network. state education system in the municipality of Coari in Amazonas. The participants were seven teachers who taught the Biology discipline in the period 2020 and 2021. A qualitative approach was adopted, data collection was carried out from September to November 2023, through semi-structured interviews. Data analysis was Discursive Textual Analysis (DTA). As a result, it was observed the difficulties faced by educators regarding the use of TDIC and the challenges of incorporating them into their pedagogical practice during the pandemic period, in addition to the lack of adequate training for the use of these tools, leads us to reflect on the legacy of this moment of crisis.

KEYWORDS: COVID-19. Emergency remote teaching. Digital technologies. Pedagogical strategies.

RESUMO: Este trabalho traz os resultados de uma pesquisa realizada em Coari, no interior do Amazonas. Teve como objetivo analisar o uso das Tecnologias digitais de informação e comunicação (TDIC) na disciplina de Biologia durante o ensino remoto emergencial na pandemia de COVID-19 em escolas da rede estadual de ensino. Foram entrevistados sete docentes de que ministraram a disciplina de Biologia no período de 2020 e 2021. A pesquisa adotou uma abordagem qualitativa, através de entrevista semiestruturada. A partir da análise dos dados observou-se as dificuldades dos educadores quanto ao uso das TDIC e os desafios de incorporá-las a sua prática pedagógica no período pandêmico. Além disso, a falta de formação adequada para o uso dessas ferramentas nos leva a refletir sobre o legado que esse momento de crise nos deixou.

PALAVRAS-CHAVE: COVID-19. Ensino remoto emergencial. Tecnologias digitais. Estratégias pedagógicas.

RESUMEN: Este trabajo es el resultado de un proyecto de investigación orientado a analizar el uso de las Tecnologías de la Información y la Comunicación Digital (TID) como estrategia pedagógica en la disciplina de Biología durante la enseñanza remota de emergencia en el contexto de la pandemia COVID-19 en escuelas de la red. sistema educativo estatal en el municipio de Coari en Amazonas. Los participantes fueron siete docentes que impartieron la disciplina Biología en el período 2020 y 2021. Se adoptó un enfoque cualitativo, la recolección de datos se realizó de septiembre a noviembre de 2023, a través de entrevistas semiestructuradas. El análisis de los datos fue Análisis Textual Discursivo (ATD). Como resultado, se observó las dificultades que enfrentan los educadores respecto al uso de las TDIC y los desafíos de incorporarlas a su práctica pedagógica durante el período de pandemia, además de la falta de capacitación adecuada para el uso de estas herramientas, nos lleva a reflexionar sobre el legado de este momento de crisis.

PALABRAS CLAVE: COVID-19. Enseñanza remota de emergencia. Tecnologías digitales. Estrategias pedagógicas.

Introduction

There is no denying that digital technologies are present in the daily lives of our students and have directly influenced the way they perceive the world. According to Jaskiw and Lopes (2020), the use of digital information and communication technologies was extremely important during the Covid-19 pandemic, which reinforced and demonstrated the need to incorporate digital practices into the educational process.

This, linked to the Covid-19 pandemic, a highly contagious disease that devastated the entire world and became a recent milestone in history, causing countless deaths and collapsing the health systems of many countries, including Brazil. In Amazonas, the first confirmed case of Covid-19 occurred on March 13, 2020, and Manaus was the first capital of the country to collapse due to the large number of people infected with the disease simultaneously (Silva; Silva, 2021).

Faced with this chaotic scenario, there was a need to maintain social distancing in an attempt to contain the spread of the disease, and educational institutions across the country had to be closed, changing the configuration of the school environment as we know it. The educational system had to reinvent itself and seeking to reduce the losses caused by the sudden closure of schools, the Ministry of Education and Culture (MEC) made it possible to replace face-to-face classes with classes mediated by the new Digital Information and Communication Technologies (TDIC), with the objective of maintaining the school's bond with students, carrying out educational activities and complying with the school calendar (Brazil, 2020).

In this way, the use of technologies has become essential in communication between the school, family and students, and an important tool in the teaching and learning process, as it has become the only form of contact between teachers, students and the school community.

According to Santos, Reck and Santos (2021), the new conditions imposed by Covid-19 forced schools to empty classrooms, decentralized the role of teachers and created new relationships, placing teachers as facilitators of knowledge.

This study is part of the master's thesis entitled *Digital Information and Communication Technologies in the teaching of Biology in the context of the Covid-19 pandemic in state schools in the city of Coari-AM*, and aims to analyze the use of TDIC as a pedagogical strategy in the Biology subject during Emergency Remote Education (ERE) during the period of the Covid-19 pandemic in state schools in the municipality of Coari/AM.

Materials and methods

Figure 1 illustrates the methodological path of the investigation. There were seven research participants, who taught the biology subject during the Covid-19 pandemic in 2020 and 2021.

Figure 1 – Methodological path



Source: Written by the author

The research adopted a qualitative approach, in which it is concerned with the level of reality that cannot be quantified, that is, it works with the universe of meanings, motivations, aspirations, beliefs, values and attitudes (Minayo, 2010).

We can classify it as descriptive and exploratory, which according to Michel (2000, p. 44), this type of approach “aims to verify and explain real-life phenomena, with possible precision, observing and making relationships and connections”, since it suggests reflections based on lived actions, with communication to the scientific community being relevant. It is recommended to guide the way in which data is collected when one intends to describe certain events (Creswell; Creswell, 2021; Gil, 1996).

This work was approved by the Research Ethics Committee - CEP in the Opinion [eliminated for peer review purposes], from which data collection was carried out, in which the objectives and purpose of the research were exposed to school teachers, the research participants were explained the guarantee of confidentiality of their identity, as well as the freedom to withdraw their consent to participate at any time.

After making the necessary clarifications, participants were invited to participate in the research, leaving the guest free to accept or refuse to participate. The signing of the Free and

Informed Consent Form (TCLE), according to resolution 466/201 2, was required for individuals who agreed to participate in the research.

Survey participants

The participants in this research were teachers who taught Biology during the period of the Covid-19 pandemic in the five schools that offer regular and integrated high school in the state education network in the municipality of Coari: Escola Estadual Prefeito Alexandre Montoril-GM3; Maria Almeida do Nascimento State School; Instituto Bereano de Coari State School; João Vieira School; State School CETI Professor Manuel Vicente Ferreira Lima.

Table 1 shows the number of participants per school who taught the biology subject in 2020 and 2021, the period in which remote classes operated.

Table 1 – Research participants by school

School name	Number of respondents
Mayor Alexandre Montoril State School	1
Bereano Institute of Coari State School	1
Maria Almeida do Nascimento State School	1
João Vieira State School	2
CETI State School	2
Total number of participants	7

Source: Written by the author

Data collection

Data collection was carried out through semi-structured interviews. This type of approach allows the research participant to speak openly about the topic, allowing them the freedom to express their thoughts, desires and experiences (Gil, 1999).

The data was collected from September to November 2023 and the script with the questions was printed and delivered so that teachers could respond according to each person's time availability.

The first topic addressed issues related to identifying the teacher's profile, such as: age, gender, academic background and time working as a teacher, as well as working hours. This information was extremely important to outline the profile of the participant in this research.

The second topic addressed issues related to teaching work during remote teaching, with the aim of identifying the main difficulties faced by teachers during this period, the methodologies/tools used in classes taught remotely, as well as knowing the main strategies that brought positive results and the most used tools.

This allowed us to understand how teachers used TDIC in ERE, as well as their perception and reflection on the technologies applied to the school environment.

The third topic, in turn, addressed teacher training, in which we sought to know the training that these teachers received during their academic life, and whether this professional received any type of preparation for the use of TDIC during remote teaching during the pandemic period.

Data analysis

Data analysis was carried out through Discursive Textual Analysis (ATD), which according to Moraes and Galiazzi (2006), “is a data analysis approach that moves between two established forms of analysis in qualitative research, which are content analysis and discourse analysis.”

Unitarization, also known as disassembly of texts, consisted of examining the materials in detail, which were separated into units of meaning. Next, the categorization process was carried out, in which relationships were established, which implies the construction of similar meanings between the base units. These combinations can generate several levels of analysis categories, which together form more complex sets.

The communication stage is the one in which we impregnate the materials, which enabled a critical understanding of the whole, which resulted in the analyzes observed and presented in this article.

Results and discussion

The teaching profiles

The first category presented is the teacher profile, the profile survey of the interviewees shows that 57.1% are female (4) and 42.8% are male (3), the majority of whom are aged between 36 and 46 years old (71.4%), followed by the age group of 47 to 57 years old (28.5%). Regarding the area of training, 57.1% have a degree in Biology (4) and 42.8% have a double degree in Biology and Chemistry (3), in addition, the majority of respondents 57.1% already

work as a teacher for more than 10 years (4), while 42.8% have spent less than 10 years in the classroom.

Table 2 shows the profile of the professionals interviewed. An attempt was made to relate gender, age, academic background, work regime, length of service and working hours.

Table 2 – Profile of interviewees

Teacher	Gender	Age	Academic background	Postgraduate	Work regime	Operating time	Workload
PROF. A	Female.	42	Biology and chemistry	Methodology applied to Chemistry	Selective	10 years	40h
PROF. B	Male.	51	Biology	Special Topics in Biology	Effective	23 years	40h
PROF. W	Female.	39	Biology	Master in Biotechnology	Effective	19 years	60h
PROF. D	Female.	37	Biology	Master's in Science Teaching	Effective	14 years	40h
PROF. E	Male.	36	Biology and chemistry	No	Effective	7 and a half years	40h
PROF. F	Male.	55	Biology	No	Effective	33 years	60h
PROF. G	Female.	46	Biology and chemistry	Biology teaching methodology	Selective	9 years	40h

Source: Written by the author

In order to preserve the identity of the participants in this research, generic identifications were adopted as shown in table 2.

It can be seen, from the profile of the interviewees, that they all have degrees in the area in which they work, having a degree in Biology or a double degree in Biology and Chemistry, and also have experience in the classroom. The majority belong to the school's permanent staff and work at least 40 hours a week in the same school or in different schools; five teachers have postgraduate degrees, three of them specialists and two who were studying for a master's degree, two of them do not have postgraduate degrees.

Teaching work and remote teaching

When asked about which school(s) the teacher worked at, the majority 71.4% responded that they worked at only one school, but accumulated 40 or 60 hours a week at the same school, while 28.5% worked at two schools or more.

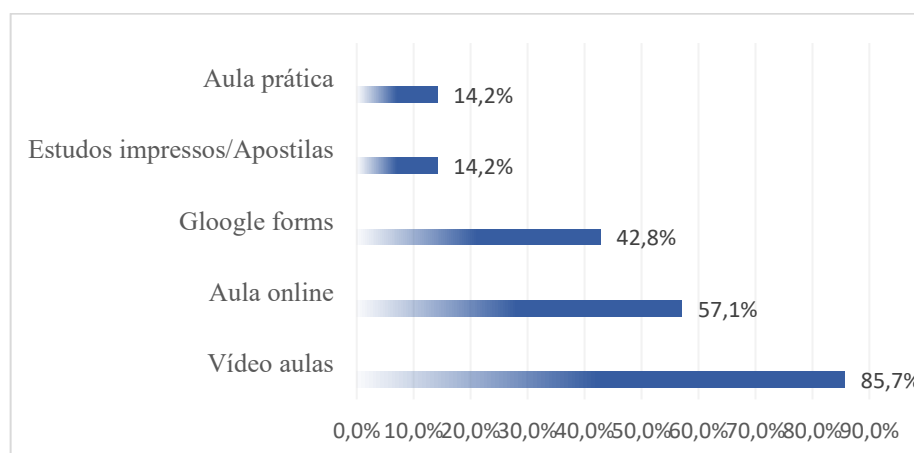
In Amazonas, students from the state network had the “Aula em casa” program, a partnership between the Amazonas Education Media Center (CEMEAM) and TV Encontro das

Águas, which broadcast educational content aimed at students from 6th to 9th grade of elementary school and the 1st to 3rd Series of High School (Silva; Silva, 2021).

An initiative that benefited several students from the metropolitan region of Manaus and neighboring municipalities. However, for most of the municipalities furthest from the capital, the open TV signal was not available, which led institutions to look for other resources to maintain the teaching and learning process. Thus, groups were created on *WhatsApp*, which became the new “classrooms.”

Figure 2 shows the main activities carried out by teachers during the ERE. You can observe the strategies most used by teachers to streamline their classes.

Figure 2 – Activities carried out by teachers during remote teaching



Source: Written by the author

Regarding the activities carried out by teachers during remote teaching using TDIC, we can observe a range of strategies used, such as: video classes, used by the majority of teachers, 85.7% of which were recorded by the teachers themselves or classes already available on platforms such as *YouTube*; in second place we have *online* classes, via *Google Meet* or *WhatsApp* itself with 57.1%. Then we have *Google Forms* with 42.8%. The activities least developed by teachers were printed studies, handouts and practical classes with 14.2% each.

It is a daily challenge for teachers to continually find resources that spark interest and effectively engage their students, who are now digital natives. To achieve this objective, it is necessary to identify educational strategies that meet this demand, and during the ERE this search became even more necessary.

In an attempt to streamline their classes, making them more attractive, teachers used different methods so that the student could have a minimum of interest in the content taught.

In this sense, Ribeiro and Silva (2022), state that students who are involved in digital practices have greater possibilities in the construction of knowledge, which stimulates discoveries, creativity in investigative processes in addition to problem solving.

When asked what methodologies and/or tools were used to teach Biology, it was observed that the use of video classes stood out, with the resources most used by teachers at 71.4% being the use of Podcasts and images/ photos were used by 42.8% each, exercises and the textbook were the option used by 28.5% each, and 14.2% in turn, used seminars, study plans, mind maps and films/documentaries as methodology /pedagogical tools.

Figure 3 demonstrates, through a word cloud, the methodologies that were most used by them in classes during the ERE.

Figure 3 – Methodologies and/or tools most used by teachers



Source: Written by the author

It can be observed that the choice of methodologies/tools is closely linked to the availability and ease of sending messages. This is due to the fact that *WhatsApp* was the most used technological resource in ERE.

It was observed that the main devices used during remote teaching mentioned by teachers were cell phones with 85.7% and notebooks with 42.8%, with *WhatsApp* being 100% the main means of communication between teachers and students. According to Negrão (2022, p. 10), “pedagogical practices with *WhatsApp* were based on the possibility of quickly sharing experiences and/or activities between teachers and students, in addition to enabling broad debate.”

This was the most viable option found by many teachers across the country, as this tool made it easier to send many files such as: photos, audios, short videos, links and texts, which

could be accessed at any time and offline after downloading (Andrade, Negrão; Vilaça, 2021; Negrão, 2022; Guimarães; Silva, 2022; Ribeiro; Silva, 2022).

When asked about the difficulties faced by teachers in using TDIC, we found that 100% of those interviewed cited the lack of internet as the main difficulty during remote teaching, which reveals how much the pandemic has further increased the social inequalities faced by students of public school in the interior of Amazonas.

PROF. A points out: *Yes, several, especially the internet, which didn't help much.*

PROF. B scores: *Yes, the internet was not used by at least 70% of students.*

For Andrade, Negrão and Vilaça (2021), the pandemic revealed a well-known reality in the interior of Amazonas, where internet connection is unstable or not even available. According to the authors, the pandemic “brought open” the differences between social classes, in which students with access to the internet had better monitoring and those who did not have access to computers, *smartphones* and televisions had their learning compromised.

Corroborating the results found in studies carried out in different municipalities in the interior of Amazonas, among which we can mention: Benjamin Constant, with a study that included the participation of 12 students in the 3rd year of high school (Silva *et al.*, 2021), Lábrea, with 21 basic education teachers (Santos; Lacerda-Junior, 2022), Codajás, which carried out a survey with elementary school II students (Magno; Yamaguchi; Guilherme, 2023), Humaitá, carried out with 10 Science teachers 6th to 9th (Costa, 2022), Humaitá and Lábrea, with six Biological Sciences teachers from the Federal Institute of Amazonas - IFAM (Carvalho; Lima, 2022), Coari, a study carried out with 419 students from five level technical courses average of IFAM (Yamaguchi; Yamaguchi, 2020) and even in the state capital Manaus, a study carried out with 20 teachers from a full-time school (Ferraz; Nascimento; Oliveira, 2023), demonstrate that socially vulnerable students suffered due to lack of internet access.

It was found that, despite all the Internet connectivity difficulties that frequently occur in the region, *WhatsApp* continued to be the educational resource that allowed the majority of students to access classes remotely.

Furthermore, it was observed that the lack of training and adequate equipment were major obstacles in the ERE, a fact demonstrated in the statements of the interviewees:

PROF. G: *“Yes, lack of internet, lack of digital equipment, lack of practice in using digital tools.”*

PROF. D: *“Formatting and compression of video classes. We had to research applications that could help me, as I didn't know how to do it. Additionally, I had to learn how to use Google Class, Meet and quiz forms.”*

PROF. E *yes! Mainly the lack of knowledge about the types and which tools could be used for, or as a tool to teach biology remotely.*

The sixth question of this stage asked teachers whether the ERE affected them in any way and, in this sense, the majority of teachers cited the reduction in academic performance with 71.4% of complaints, followed by the lack of feedback from students with 57.1%. We can also highlight the lack of digital equipment and emotional overload with 14.2% each.

Furthermore, it is noted that the social inequality faced by many students is one of the factors that directly affected the reduction in academic performance and this lack of return on the part of students to the activities proposed by teachers.

The lack of digital equipment led many teachers and students' families to purchase new electronic equipment to meet their needs, demanding more financial resources without support from the Amazonas state government. All this in an attempt to improve access to education for their children (in the case of parents) and students (in the case of teachers). Therefore, cell phones, computers, lighting equipment, tables, chairs, tripods, among other resources, are materials that were not included in the budgets of many Brazilian families (Jaskiw; Lopes, 2020).

Furthermore, the use of supplies and medication, whether for the treatment of Covid-19 or for psychological problems, a fact observed in many studies carried out, during this period greatly increased the cost of living (Silva; Silva, 2021; Mattos *et al.*, 2020).

In addition to this, we have an increase in food costs, as many students eat their main meals of the day at school. With this issue in mind, in April 2020 the state government announced Merenda em Casa, with the aim of continuing to provide food to students in the network (Silva *et al.*, 2023).

It is worth highlighting the emotional overload faced by professionals from different areas, and this fact can be summarized in PROF D's speech.:

PROF. D: *“Emotional overload, because in addition to the fear of contracting the disease, I continued working remotely, with responsibilities at home, children who were also in online classes, and the responsibility of learning to use new methodologies to try to adapt to the new way of teaching.”*

Santos, Cavalcante and Lima (2023), highlight the overload of teachers who are also mothers. These women, in addition to remote work, which demanded a lot of their time, play an integral role, in addition to the many domestic tasks. Thus, all this work overload led many women to physical, emotional and psychological exhaustion.

For Jaskiw and Lopes (2020), “remote teaching without adequate conditions has caused a feeling of discouragement and apathy in women who are teachers and mothers, feelings similar to Burnout syndrome”. Burnout syndrome, also known as professional exhaustion syndrome, occurs when work is carried out at home and it is difficult to distinguish between work and rest environments (Mattos *et al.*, 2020).

Teacher training

The third stage of the interview highlighted teacher training. When asked whether these teachers continued their academic training after graduation, we observed that the vast majority said yes, five teachers, which is equivalent to 71.4% of those interviewed, while 28.5% said no. Of the five teachers with postgraduate degrees, three are specialists and completed their postgraduate course in the EaD format and two are finishing their master's degree, however, they continue working, as they did not receive authorization from the state to study it. Two of the interviewees reported that they did not undertake any type of specialization. When asked why they did not continue their studies, the answer was the same.

PROF. E: “ *No, because of work, where the sector does not release the employee to study.* ”

PROF. F: “ *No. First, the state does not allow you to do so. According to family, work, support, etc. Third, commitment and others.* ”

Although there is legislation that supports civil servants being removed to study, according to State Law No. 1,762/86 of the Statute of Civil Public Servants of the State of Amazonas, according to which:

Art. 115 - The student employee will be allowed to be absent from work, without prejudice to salary, remuneration or advantage, to take a test or examination, upon presentation of a certificate provided by the educational establishment. Art. 116 - The employee may be authorized for study or improvement outside the State, at the discretion of the Head of the Power of which he/she is a member, and for a period not exceeding three years, without prejudice to salary or remuneration (our translation).

From the teachers' outburst, it can be seen that there is a lack of incentive on the part of the state regarding continued training. Servers often run into bureaucracy and the slowness of

the process, which ends up discouraging them from seeking professional growth and, consequently, improvements to their teaching practice.

According to Nóvoa (2017), “teacher training is a political problem, and not just a technical or institutional one.” There is little or no support from the State with regard to teacher training and training.

When asked about the public policies offered by the state to provide support and technical support for the ERE, a teacher cited the books offered to students, which corresponds to 14.2%; a teacher mentioned *Aula em Casa*, with 14.2%; another cited little training on the part of the school's pedagogical team 14.2%; and 57.1% of those interviewed said they had not received any type of support.

It is observed that only 14.2% of the interviewees stated that they had been offered pedagogical training with some instructions, but this guidance came from the institution's own pedagogical team, while the majority, 85.7% of the interviewees, declared that they had not received any training course or training to adapt to the ERE.

From the teachers' reports, we can observe that, even without the support of the state government, they sought to improve their knowledge on their own, looking for ways to improve the teaching and learning process during the ERE.

For Nóvoa (2017), teacher training must create the conditions for a renewal, recomposition, of pedagogical work, at individual and collective levels. In this sense, the government of the state of Amazonas made alternatives available in partnership with other continuing education institutions for teachers through the Saber+ Platform, which promoted *lives* and conversation circles with local, national and international intellectuals, and a partnership with Fundação Telefônica Vivo for teacher training, through the Connected Schools Platform (Silva *et al.*, 2023).

However, it did not take into account the time available for these professionals to participate in these trainings, as many worked 40 to 60 hours a week, not counting the extra hours of caring for students and guardians, which demanded a lot of their time. It is worth mentioning that these hours were not recorded during this period.

Andrade *et al.* (2021), notes that:

There are still gaps in initial and continuing teacher training - problems that predate the pandemic. A challenge for training that is posed and which does not only depend on the 'will' of educators, but also involves teacher training policies in/from/for the Brazilian Amazon (Andrade *et al.*, 2021, p. 62, our translation).

It is understood, therefore, that it is necessary to provide broad access to continuing education programs through public policies, guaranteeing the exit of teachers to pursue postgraduate studies without causing harm to their treasury.

Conclusion

It is necessary to reflect on the legacy that the COVID-19 pandemic left for public education in Amazonas. In addition to facing all the challenges to overcome the old structural problems of education and social inequalities, many teachers had to reinvent themselves, some without any support or qualifications necessary to overcome all the obstacles imposed by this moment of crisis.

The challenges were many and ranged from personal investment in the structure of their homes to be able to continue their classes online, to changing family habits. The moment also required more time to prepare classes and correct the proposed activities, in addition to the availability for students and families to ask questions, which resulted in an overload of work, contributing to the physical and mental illness of many teachers.

This crisis highlighted many of the problems that already exist in education, such as digital exclusion and the lack of access to quality internet, which has become one of the biggest challenges for the continuation of classes at ERE, especially in public schools in the interior of the state of Amazonas, where the internet signal is not good or does not exist.

Furthermore, with the results obtained, it was observed that many teachers still have difficulties when using digital technologies. Linked to this is the lack of adequate training, which reveals the absence of public policies that take into account the needs of this class of workers.

It is not enough to just offer; it is necessary to provide subsidies that allow teachers to be trained and able to incorporate TDIC into their teaching practice. In terms of education, if there is something positive that this moment has shown, it is precisely the importance of teachers in the teaching and learning process.

Furthermore, there is no denying that digital tools were of fundamental importance in reaching and stimulating student learning during the pandemic period. However, with the return of in-person classes, we will be able to understand the gaps left by this period of crisis.

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