Remote Teaching's Legacy Perceptions: An Interview Study with Brazilian Education Professionals

Mayka de S. Lima[1], **José Maria N. David**[2], **Rita Suzana P. Maciel**[1]

[1] Federal University of Bahia (UFBA)
Caixa Postal–40170-110–Salvador–BA–Brazil

[2]Federal University of Juiz de Fora (UFJF)
Caixa Postal–36036-900–Juiz de Fora–MG–Brazil

{mayka.lima@ufba.br, rita.maciel@dufba.br,jose.david@ufjf.edu.br

Abstract. *Remote teaching has provided a range of experiences for education professionals. Likewise, this study presents a comprehensive discussion from semi-structured interviews about these educational experiences through a post-pandemic lens. Interviews assist in acquiring memories by focusing on specific aspects, such as perceptions of teaching practices, technological difficulties, and vital functionalities for remote teaching. The study used qualitative methods to dissect the responses of 25 education professionals at different levels of education. As a result, we obtained a comprehensive understanding of the professionals' individual experiences, indicating the importance of integrating pedagogical resources and strategies into educational practices.*

1. Introduction

The growing use of digital technological resources (DTRs) at all levels of education in Brazilian institutions has proved essential for teaching and learning, supporting both the face-to-face and remote teaching (RT) modalities. Adopting DTRs, such as educational software, videoconferencing, and Learning Management Systems (LMSs), have become essential allies in teaching and learning, enabling self-learning in pedagogical practices (Souza, 2023). With the outbreak of the pandemic, the use of DTRs has attracted rapid adaptations by education professionals as lesson planning. It has been essential in ensuring the continuity of teaching after the pandemic. Medeiros (2023) points out that educational institutions should look for ways around this problem by providing students with devices and internet access.

Studies such as Lima and Maciel (2021) explored the experiences of RT, as it surveyed 140 higher education professionals from various fields. One of the main conclusions was that 88% of the professionals had an intermediate or advanced level in using DTRs in teaching before social isolation; 67% were already implementing active methodologies, and 98% favored using DTRs in face-to-face teaching. The study by Deus, Fioravanti, Oliveira, and Barbosa (2020) used a survey of 137 higher education teachers, where they identified a need for pedagogical strategies in the Brazilian context, where professionals needed more time and schedule to adapt their teaching materials. In this study, a more significant impact was seen in interaction with students, the assessment process, and activities than in the recording of lessons.

These results indicate that using a plurality of DTRs, such as LMSs, Zoom, and Google Meet, interacts with students and significantly improves teaching practices. Thus,

DOI: 10.5753/sbie.2024.242706

using these DTRs in RT as an educational strategy has become evident, leading organizations to make appropriate technological infrastructures and resources available to educational institutions (Mattar et al., 2022). These studies also identify urgent opportunities for further research into understanding what has happened to blended education post-pandemic (Forman, 2023). Mattar et al. (2022) refers to the need to collect and revisit data, to give voice to the actors who have lived through the pandemic, and from this data to reconstruct our theories

Against this backdrop, crucial questions arise about the perceptions of education professionals when implementing RT and the role of application functionalities in this context: *What are the perceptions of these professionals when implementing RT? Did the App's functionalities help to adapt and improve the performance of the pedagogical practices adopted?* Aware of these challenges and as a second stage of the (Lima, David, & Maciel, 2024), our research group conducted semi-structured interviews with professionals from public and private institutions in various Brazilian states. The interview method was chosen because it allows for an in-depth and detailed understanding of individual experiences, asking additional questions as necessary and allowing participants to contextualize their experiences.

This paper interviews twenty-five (25) education professionals from different Brazilian states, from public and private primary, secondary, and higher education institutions. The interviewees comprehensively visualized the practices and functionalities of the apps adopted in post-pandemic RT. Data was collected from education professionals between July and August 2023. We used the coding technique for the qualitative analysis to identify concepts and categories (Sampaio & Lycarião, 2021).

The interview data provided an in-depth experience of education professionals, highlighting the challenges and opportunities in adopting new technologies for RT. Among the findings, the diversity in the strategies adopted by education professionals was a key point. It was observed that the higher the level of education, the greater the experience and diversity with DTR during RT. The main research opportunities identified were developing more intuitive and integrated educational tools and researching the effectiveness of DTRs and active methodologies.

These results have significant implications for the educational software industry, inspiring the development of more intuitive and integrated platforms to facilitate adaptation or tools with personalization for teaching (Venega & Maciel, 2021). For academia, they include a deeper exploration of blended teaching methodologies and the effectiveness of different technological tools in improving pedagogical practices. We took these measures to maintain the highest standards of research ethics, as described in the project submitted on the Brazil platform under CAAE 76176523.4.0000.8042.

The structure of this article is designed as follows. Section 2 presents related work. Section 3 discusses the research methodology, followed by the results in Section 4. The discussion of research questions is covered in Sections 5 and 6, followed by the conclusions.

2. Related Works

RT, using DTRs, is characterized by making face-to-face elements available in remote environments and providing learning-oriented experiences for students (Araujo, de la

Higuera Amato, Martins, Eliseo, & Silveira, 2020). RT requires an intellectual effort to understand methodological concepts and practices, bringing knowledge closer to practice. Learning Environments (LMSs) socialize live, working with multiple media and resources, favoring the development of activities at the pace of each student (Theodoro & Gomes, 2022). In this context, the importance of flexibility and interaction in the RT process is emphasized, rejecting the notion that simply publishing content on the web constitutes a distance course.

According to Pulham and Graham (2018), using RT creates challenges and perspectives for education professionals, which will soon require competencies in the training curriculum. Personalized teaching will be the reference most cited as justification and success for implementing this methodology, emphasizing instructional design to design, deliver, and support teaching.

Information technologies have provided a range of experiences for education professionals, which is why several interview studies have been carried out. The study by Villarreal, Villa-Ochoa, and Galleguillos (2023) highlighted the challenging transition to RT, showing changes in interactions and teaching through videoconferencing. The 24 teachers reported aspects of the experiences learned in the transition between RT and the opportunities and limitations experienced in using DTRs.

Considering the Brazilian context, studies such as De Deus, Fioravanti, de Oliveira, and Barbosa (2020) developed a survey with 137 teachers from 69 Brazilian educational institutions who responded from June to July 2020. The main results achieved include the impacts observed to improve digital accessibility for students with disabilities, highlighting the use of LMSs. In Cordeiro, Coelho, Saraiva, de Almeida Rodrigues, and Pinheiro (2020)'s study, interviews were conducted with four higher education professors from public and private institutions, obtained between 1 and 10 October 2020, highlighting the difficulties faced in RT. The results showed ways of teaching, such as remote and semi-presential classes. Still, the difficulties of access for students and teachers were evident in the responses, pointing to the need for investment in DTRs and planning for RT (Cordeiro et al., 2020).

These studies provide an overview of RT practices and challenges, offering practical implications that can empower and motivate education professionals. The first phase of the research work, which involved a survey of 276 education professionals in Brazil to explore the use of RT and active methodologies during and after the pandemic, has practical implications for the future of education. This work analyses the responses of 25 professionals through interviews, providing a comprehensive understanding of the main applications, functionalities, and challenges professionals face when returning to the face-to-face modality. The survey during the pandemic offers a snapshot of immediate responses and adaptations. At the same time, this current study deepens the legacy of RT, providing deeper insights into its lasting effects and the evolution of educational practices among brazilian professionals.

3. Research Methodology

Our research project aims to investigate the use of DTRs by education professionals in the RT modality during and after the pandemic. Therefore, this interview study seeks to deepen education professionals' perceptions of the pedagogical practices and applications

used in RT.

The qualitative research method, through semi-structured interviews, will provide descriptive data from education professionals involved in the RT modality, and the study's analysis was exploratory, using grounded theory strategies, emphasizing the systematic collection, processing, and analysis of data (Glaser & Strauss, 2017).

The research questions were carefully formulated to uncover the practices and functionalities of the applications adopted in the Brazilian RT modality after the pandemic. Based on the pedagogical practices chosen and the functionalities of the applications, these questions are crucial to understanding how they facilitated the teaching process.

* RQ1: How do education professionals characterize the practices adopted in RT in the teaching and learning process? *This question investigates the perceptions of education professionals when adopting remote teaching in the teaching-learning process after social isolation.*

* RQ2: What difficulties do education professionals face when using the practices adopted in RT? *This question investigates the problems of education professionals' problems in RT practices after social isolation.*

* RQ3: What applications did education professionals use to carry out the practices in the teaching and learning process? *This question investigates education professionals' applications after social isolation.*

* RQ4: What functionalities of the apps did the education professionals use to carry out the practices in the teaching and learning process? *This question investigates the functionalities of the applications used by education professionals after social isolation.*

3.1. Interview design

The semi-structured interview is an essential data collection technique in qualitative research (Vieira, 2017). In addition, semi-structured interviews are particularly suitable for collecting qualitative data because, unlike questionnaires, they allow for discussion or exploration of new topics that arise during data collection (Marshall, Brereton, & Kitchenham, 2015). In this study, we followed the guidelines proposed by Kitchenham and Pfleeger (2002). The following paragraphs describe the steps taken.

Regarding subjects, we selected education professionals who worked in classroom teaching, migrated to RT during social isolation, and continued using DTRs post-pandemic. Three criteria were considered in the selection: analysis of the profile, considering experience in education at any level of education and training, analysis of the function in the field of education, and the interviewees must be involved in classroom teaching activities during and after social isolation.

Invitations to participate were sent by email with the Informed Consent Form (ICF), ensuring the ethical position and safeguarding the anonymity of the professionals. The exclusion criteria for the study were strictly defined, including non-acceptance of the terms of consent for the research, not having worked as a teacher during social isolation, and not having taken part in the survey carried out in the first phase of this research project. We are committed to conducting this study with the highest ethical standards.

About the interview script, the questions are grouped into blocks according to the themes and are available in Appendix A. Block 1 introduces the interview with personal, professional, and teaching institution questions, recognizing the significant impact of your experiences on our research. Block 2: questions about the RT modality in your institution and your activities after adopting RT. Block 3: deepens the interview about the RT experience. Block 4: experiences with teaching methodologies. Block 5: Which applications have you used in class, and what difficulties have you encountered adapting to RT? Moreover, Block 6 portrays the education professional's general experience of RT.

Moreover, the Grounded Theory (GT) technique was adopted to report on the analysis of the results. This technique identifies concepts (or codes) and categories and consists of three phases: (i) open coding, (ii) axial coding, and (iii) selective coding. This research used phases I and II of GT, and according to Conte, Cabral, and Travassos (2009). Categories are arguments for existing concepts at a higher level of abstraction and were organized and grouped the coded data into families, sharing their characteristics (Sampaio & Lycarião, 2021). The coding process was a collaborative effort, with the first author leading the coding, which was reviewed by the second and third authors, who applied the codes and formed the categories.

4. Results

This section presents the data obtained from the interviews. As stated before, we obtained 25 responses for analysis at primary, secondary, and higher education levels. The answers to the interview questions were analyzed using the coding technique (Yin, 2016) to organize and group the coded data into categories, sharing their characteristics (Sampaio & Lycarião, 2021). Initially, we will present the general analysis of the respondents' profiles and results and discuss each level. Finally, a general discussion will correlate the data between the three levels of education.

4.1. Respondents' Profiles

Analyzing the profile of 25 education professionals resulted in responses from 5 Brazilian states, with a significant majority coming from the Northeast region, specifically Bahia, Maranhão, Piauí, and Sergipe. These states accounted for 92% of all respondents, emphasizing regional representatives and the importance of their perceptions. Around 84% teach in public institutions; 44% work in the exact and earth sciences, and 12% in the humanities. It is important to emphasize that public schools and universities represent the majority of educational institutions in Brazil. Additionally, professionals in the exact sciences, such as math, physics, and chemistry, often have a more profound understanding of technology and its applications than professionals in other fields. Their involvement in the research conducted in the first phase of this project provided a solid basis for their experiences and use of teaching methodologies. This active participation motivated the educators to provide feedback on their context, which was highly valued and respected, demonstrating their commitment to improving educational quality.

For the benefit of this text's readers, we have prepared figures that briefly summarize the data for each level of education. As previously stated, we used a coding technique to summarize the qualitative analysis of the research questions (RQ1 to RQ4). This approach has allowed us to identify four (04) categories of codes that express the main concerns about challenges and strategies in the transition from traditional to remote teaching

in the post-pandemic period. These findings are particularly relevant as they shed light on the critical issues faced in this crucial transition:

- Perceptions: Education professionals expressed various perceptions about adopting RT, such as the lack of training and the need to adapt to new DTRs or methodologies. They refer to opinions, feelings, and understandings regarding the implementation and practice of RT.

- Difficulties: The interviews revealed two main difficulties faced by teachers: student dispersion and adaptation to the tools. These were considered significant problems, indicating that keeping students focused and engaged during remote classes took much work, encompassing challenges and obstacles faced during the transition and practice of RT.

- Applications: Google Classroom and WhatsApp were the most crucial applications for supporting teachers. These platforms allow teachers to stay connected with their students, create online activities, and provide quality teaching materials. They refer to the software and platforms used to carry out teaching and learning activities in RT.

- Functionalities: Several functionalities were identified to help with teaching practices. These were tools to facilitate the availability of materials and videos, attendance control, assessments, integration with YouTube videos, and content storage. They refer to the characteristics and capabilities of technological tools that could facilitate and improve teaching and learning at RT.

4.2. Elementary School

Sixteen percent (16%) of the interviewees were elementary school teachers, representing four education professionals from the linguistics, literature, and arts disciplines. Of these, three had some experience of RT and skills in using DTRs. However, 75% of elementary school teachers said they had not received training or courses for the RT modality. Many teachers had to adapt quickly to RT and continue teaching their students during the migration between face-to-face and remote modes.

Figure 1 shows the results for elementary school. Regarding education professionals' perceptions about RT practices (RQ1, perceptions, in (Figure 1)), the professionals perceived difficulties in adopting the modality, a lack of training, and the need for teachers to adapt. Teacher F mentioned in his interview that "as well as being a big change, adaptation will depend on the mental strain it will put on the teacher when planning lessons."

Another relevant factor observed was the difficulty faced by teachers. In categorizing difficulties (RQ2), we identified two principal codes: student dispersion and adaptation to the tools (Figure 1). One teacher replied that "the difficulty of accessing and using tools" was the main difficulty in elementary school. Among the respondents at this level, two cited adaptation to the tools, and two mentioned student dispersion as a difficulty faced in the RT modality. In RQ3, regarding the applications used to carry out RT practices, Google Classroom and WhatsApp were essential in supporting elementary school teachers, allowing them to stay connected with students and provide quality teaching materials even at a distance.

When asked, "Which applications have education professionals used to carry out their teaching and learning practices?" We obtained two coding categories for the ap-

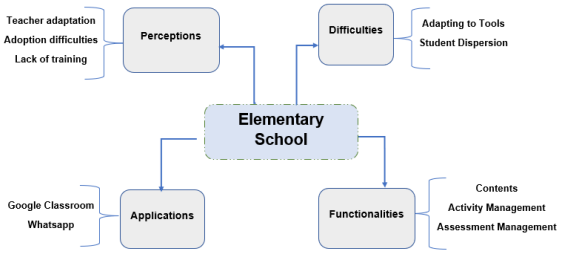

Figure 1. Coding related to the interviews in the RT for elementary school.

plications: Google Classroom and WhatsApp. None of the respondents mentioned the possibility of implementing and using LMSs during the school term, which shows that LMSs were not widespread or are not a DTR option at this level of education (Figure 1).

The need for more interactive tools in RT practices is a pressing concern. Only 3% of teachers considered it essential to have a feature for managing content, and 6% for managing student activities. In primary schools, most activities are designed to make learning fun and engaging for students, as the interaction between teacher and student is significant at this stage of teaching and learning (Machado et al., 2022). However, with the RT modality, we realize the urgent need for more interactive tools to facilitate communication and maintain the quality of education.

Comparing the results of our previous work Lima and Maciel (2021), elementary school education professionals increasingly incorporate technology into their teaching methods. This issue includes using computers and smartphones, videoconferencing via Zoom or Google Meet apps, and creating online quizzes or interactive activities. These trends underscore the need for teachers to adapt to the changing educational landscape.

Education professionals, including primary school teachers, unanimously underscore the irreplaceable role of physical and visual contact in the educational process for children and adolescents. This level of education remains a vital component of interpersonal relationships. Technological tools can enhance the flexibility of face-to-face meetings, forming the concept of blended education. Still, it cannot replace the importance of physical and visual contact, which is ingrained in the primary education system.

4.3. High School

In high school, the skills, knowledge, and values acquired in general education curricular components are applied and contextualized in vocational training practices. This survey shows that 36% of high school education professionals cover the areas of Exact and Earth Sciences, Applied Social Sciences, Agricultural Sciences, and Engineering. Of these, eight were from public institutions and one from both (public and private), whose efforts provide invaluable insights into using pedagogical practices in RT.

High school teachers also had to adapt quickly to RT to continue teaching. The interviews with these professionals revealed several categories of results, especially in difficulties and applications. These categories, including teacher adaptation, difficulties in adoption, and lack of training, were observed in the survey to provide a structured analysis of the challenges and insights related to using pedagogical practices in distance learning and vocational training. RQ1 (Figure 2) shows the results for secondary schools. When

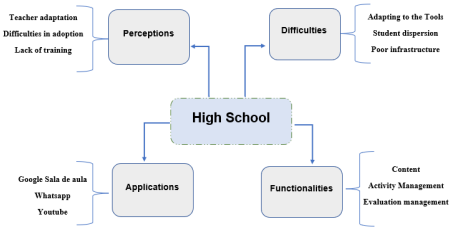

Figure 2. Coding related to the interviews at RT for high school.

asked, ”How do education professionals characterize the practices adopted in distance learning in the teaching-learning process?” these categories were particularly relevant. One education professional replied ”the teacher needs to master lesson planning for RT to work at this level of education.”In contrast, another teacher pointed out that ”RT is difficult to adopt due to the lack of training in this modality for many education professionals.”

One teacher mentioned in his interview that ”they characterize the practices of RT as difficult to adopt,” categorizing them as difficulties in adoption. The same categories were selected for the primary level. In categorizing difficulties, referring to RQ2, we obtained three codes: adapting to the tools, student dispersion, and poor infrastructure (Figure 2).

Regarding the answers to RQ3 (applications, Figure 2), the most used application in the performance of RT practices was Google Classroom (13%), followed by YouTube (4%) and WhatsApp (2%). These applications played an essential role in supporting secondary school teachers. Some of these teachers reported that using YouTube facilitated the transmission of recorded or live lessons, helping with communication and the exchange of quality content.

In addition, RQ4, ”What functionalities do education professionals use in applications to carry out their teaching practices?” 12% of respondents reported missing functions that made materials and videos more readily available. Thus, the most used functionalities generated three coding categories: content, activity management, and assessment management (Figure 2).

Thus, the majority reported that the total replacement of face-to-face classes is unfeasible because the exchange of knowledge in face-to-face meetings cannot be replaced by RT, which is why they believe in blended teaching. Therefore, unlike elementary schools, education professionals at this level used other media and faced more significant challenges due to inadequate infrastructure, which demands empathy and understanding. In Lima and Maciel (2021), high school education professionals already had a better understanding of some applications and tools, as can be seen from the interviews; Google Classroom, YouTube, and WhatsApp were the most used, although they emphasized the need for essential functions for managing assessments and activities, as well as essential functions for storing teaching content.

4.4. Higher Education

The survey data, collected from a diverse group of higher education professionals, including graduates in Exact and Earth Sciences (16%), Human Sciences (8%), Applied Social Sciences (8%), Agricultural Sciences (4%), and Health Sciences (4%), is a testament to

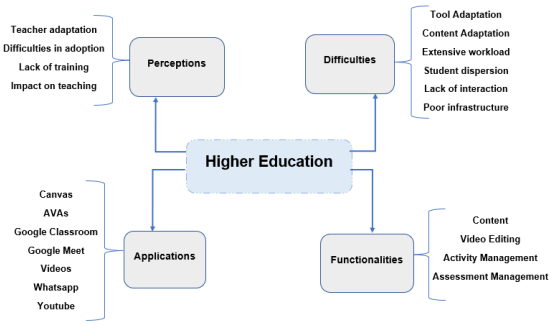

Figure 3. Coding related to the interviews at RT for Higher Education.

the broad applicability of the findings. This diverse representation ensures that the findings are comprehensive and relevant to various educational contexts, including yours.

Adaptation to the RT modality could have been more impacting for higher education teachers, as most were already familiar with the tools and applications used during the pandemic, based on our previous work (Lima et al., 2024). The interviews with these professionals showed results with more categorizations compared to the other levels of education.

In RQ1 (Figure 3), when asked: ”How do education professionals characterize the practices adopted in remote teaching in the teaching-learning process?” The categories observed were teacher adaptation, difficulties in adoption, lack of training, and impact on teaching. About this first question, one teacher said that ”this change to RT will bring a great legacy due to the wide use of DTRs,” and another teacher said that ”it will be a great change in teaching,” categorized as the impact on teaching (Figure 3). In the categorization by difficulties, referring to RQ2, we obtained six codes: Adaptation of tools, adaptation of content, extensive workload, dispersion of students, lack of interaction, and poor infrastructure (Figure 3).

The most significant difficulty encountered at this level of teaching was adapting the tools (29%), followed by poor infrastructure (22%) so that the RT modality could continue in the post-pandemic period. Regarding adapting the tools provided by the institution, one teacher reported that ”in some cases, they offered tools but didn’t provide adequate training or courses for better use.”

Regarding the answers to RQ3 (applications, Figure 3), Google Classroom (33%) was the most widely used application in the performance of RT practices, followed by LMS applications (17%) and WhatsApp (17%). These applications were essential for activities to continue after the return to face-to-face teaching and played a crucial role in supporting higher education teachers.

In addition, RQ4, ”What functionalities do education professionals use in applications to carry out teaching and learning practices?” 45% of respondents reported missing functions that made materials and videos more readily available. Thus, the most used functionalities generated four coding categories: content, video editing, activity management, and assessment management (Figure 3).

About higher education, 54% of respondents worked in public institutions, with a predominance of graduates in Exact and Earth Sciences. Adapting to RT was less im-

pacted due to previous familiarity with digital tools, as observed in the (Lima et al., 2024) study. The interviews highlighted adaptation to the tools (29%) and poor infrastructure (22%) as the main difficulties. Google Classroom (33%), LMSs (17%), and WhatsApp (17%) were the most used applications, essential for the continuity of activities when returning to face-to-face teaching. In terms of functionalities, there was a demand for better tools for making materials and videos available, focusing on content, video editing, activity management, and assessments, highlighting the need to improve educational platforms.

5. General Discussion

The interviews underscored the remarkable resilience of education professionals across all levels (primary, secondary, and higher education) in public and private institutions. They made a significant effort to adapt to the RT modality, which was urgently implemented during and after the pandemic. The main findings of the interviews revealed a spectrum of experiences and diversity in the strategies adopted by teachers. Notably, the higher the level of education, the more profound the professional experience with DTRs and the diversity in the strategies used during RT. Higher education professionals, in particular, demonstrated a more profound familiarity with DTRs than their primary and secondary school counterparts. It was found that LMSs were not used in primary and secondary education.

The adoption of methodologies and technologies emerged as a significant challenge. Many professionals, regardless of their level of training, mentioned the complexity of adapting classroom teaching to RT as a common barrier. It was found that LMSs were not used in primary and secondary education. In higher education, 17% of education professionals used LMSs, and these mentioned that they continued to use them after returning from face-to-face classes. In the interviews, it became clear that, in primary education, the most significant difficulty was adapting to the tools offered for the RT modality. However, the potential of LMSs to improve teaching and learning was evident, underlining the need for their wider adoption. For this reason, they used WhatsApp and Google Classroom as the most convenient applications for making materials and videos available to their students.

Education professionals in secondary schools also had to adapt to the tools suddenly, mainly because educational institutions needed to offer training courses in good time, delaying learning and the provision of materials to students. LMSs were only mentioned in higher education, emphasizing functionalities related to storing content for classes, managing assessments and activities, and editing videos.

The research opportunities resulting from the interviews point to the urgent need for more intuitive and integrated educational tools and platforms. These tools should be designed to facilitate teachers' day-to-day use, thus increasing their adaptability. The effectiveness of using DTRs and the application of active methodologies also present a promising area for future research to identify the most beneficial methodologies regarding engagement and knowledge retention. As such, studying the long-term impacts of DTRs on student learning and classroom dynamics can provide valuable information for future educational strategies. The interview data highlights the challenges and opportunities in adopting new technologies. These results have significant implications for the

educational software industry and academic research, offering valuable information for future improvements and adaptations in RT.

5.1. Answers to the research questions

This section discusses previously presented research questions (Section 3).

1. *How do education professionals characterize the practices adopted in RT in the teaching and learning process?* The pedagogical practices adopted at RT have undergone necessary but challenging adaptations. Analysis of the interviews revealed that most teachers adapted quickly to digital tools such as LMSs and content tools. They emphasized the need for more training and technical support to deal with DTRs. Importantly, they stressed the effectiveness of active methodologies, such as the flipped classroom, in engaging students and improving the learning process. Some difficulties reported in previous studies highlighted the challenge of keeping students engaged through digital platforms and the importance of active methodologies (Lima et al., 2024).

2. *What difficulties do education professionals encounter in using the practices adopted in RT?* Education professionals have faced various problems using the practices adopted in RT. Reports of challenges include adapting the content and the need for family support, poor infrastructure, and meaningful interaction. Adapting content to digital platforms and inadequate infrastructure were mentioned repeatedly (Lima et al., 2024). Thus, the dispersion of students and the lack of adequate technical support were significant barriers to implementing quality RT.

3. *What applications have education professionals used to carry out teaching and learning practices?* Education professionals used different applications to support their pedagogical practices in RT. Google Classroom is used to manage activities and communication, YouTube is used to make video lessons available, and WhatsApp is used for quick student interactions. The preference for Learning Management Systems (LMS) applications, such as Moodle, was highlighted, with 50% of respondents using this platform to create interactive environments and make teaching materials available. Other tools mentioned include Microsoft Teams for synchronous classes and WhatsApp for quick communication.

4. *What functionalities did the education professionals use in the apps to carry out the practices in the teaching and learning process?* Some features mentioned to carry out teaching and learning practices during RT helped manage activities and assessments and make content and video lessons available. Applications such as Google Classroom and YouTube created an organized task structure and facilitated student access to teaching material. Tools such as Google Meet and LMSs (Learning Management Systems) were essential for synchronous and asynchronous classes, enabling more significant interaction between students and teachers.

5.2. Threats to Validity

The associated risks that could jeopardize the study were identified during its planning and execution: (i) construct validity - this risk refers to the respondents' understanding of the questions presented, which could negatively affect the answers obtained. Thus, some refinements were made in cases where there were doubts about what was being asked, clarifying the questions that were most sensitive to this factor and carrying out pilot tests

to guarantee the quality of the open questions; (ii) internal validity - the selected respondents cannot represent the entire population of professionals in this period. However, responses were obtained from professionals working in Bahia (15), Maranhão (1), Piauí (1), Tocantins (2), and Sergipe (6), totaling 25 participants. Therefore, we believe this group has certain representatives, minimizing this threat; (iii) external validity - the interview was conducted as widely as possible to meet the expectation of reaching a considerable number of respondents, covering as much as possible. We obtained a more significant number of responses in the survey carried out previously; and (iv) reliability - the control and integrity of the data obtained through the interviews was stored through Google Meet, a private platform. The interviewees were informed about the recording, and the research process was well organized, planned, and based on an honest dialogue about the participation assumed by each group, which was fundamental to avoiding interpretative bias.

6. Final Remarks

The study's findings, which encompass a range of perspectives on adapting RT practices after the pandemic, are of significant importance in the current educational landscape. The study underlined the importance of this topic but also revealed several open questions and research opportunities.

The shift to RT has underlined the need to maintain the quality of teaching in the face-to-face modality, a challenge that both the interviewees and the data from the previously conducted survey point to. This information is crucial for educators, researchers, and educational institutions to be aware of and consider in future endeavors.

The study revealed that professionals are almost unanimously optimistic about the potential impact of DRTs and active methodologies on face-to-face teaching in the future. This issue opens the way for fascinating future research exploring how these technologies and methodologies can be integrated sustainably and effectively into face-to-face teaching, ensuring a smooth transition and continuous improvement in educational quality. We emphasize the vital role of collaboration in this journey, stressing the need for collective efforts in exploring the changes in educational practices brought about by the pandemic. This collaborative approach will foster a sense of value and integration among stakeholders, leading to improved educational outcomes.

The results provide significant implications for educational software and offer valuable insights that illuminate future RT improvements. In future work, it is crucial to delve deeper into the topic through more interviews to investigate the effectiveness of the features that education professionals use. In addition, investigating best practices in using LMSs and other digital tools in blended teaching can provide valuable information for ongoing teacher training and curriculum adaptation. Analyzing the impact of these technologies on student-teacher interaction and student participation is also a promising future study.

References

Araujo, R. M. d., de la Higuera Amato, C. A., Martins, V. F., Eliseo, M. A., & Silveira, I. F. (2020). Covid-19, changes in educational practices and the perception of

stress by higher education teachers in brazil. *Revista Brasileira de Informática na Educação*, *28*, 864–891.

Conte, T., Cabral, R., & Travassos, G. H. (2009). Applying grounded theory to the qualitative analysis of an observational study in software engineering–a report of experience. In *V workshop "a sociotechnical look at software engineering"(woses 2009)* (Vol. 1, pp. 26–37).

Cordeiro, M. V. C., Coelho, N. B., Saraiva, P. M., de Almeida Rodrigues, T., & Pinheiro, A. d. A. G. (2020). The new challenges for hei teachers in the aftermath of the pandemic: A study carried out with teachers from higher education institutions in juazeiro do norte-ceará. *ID online. Revista de psicologia*, *14*(52), 703–717.

De Deus, W. S., Fioravanti, M. L., de Oliveira, C. D., & Barbosa, E. F. (2020). Emergency remote computer science education in Brazil during the Covid-19 pandemic: Impacts and strategies. *Brazilian Journal of Informatics in Education*, *28*, 1032–1059.

Deus, W. S. d., Fioravanti, M. L., Oliveira, C. D. d., & Barbosa, E. F. (2020, dez.). Emergency remote computer science education in brazil during the covid-19 pandemic: Impacts and strategies. *Revista Brasileira de Informática na Educação*, *28*, 1032–1059. Retrieved from https://journals-sol.sbc.org.br/index.php/rbie/article/view/4234 doi: 10.5753/rbie.2020.28.0.1032

Forman, K. B. (2023). *Faculty perceptions of readiness and confidence for teaching online: An evaluation of online professional development* (Unpublished doctoral dissertation). University of South Carolina.

Glaser, B. G., & Strauss, A. L. (2017). *The discovery of grounded theory: Strategies for qualitative research*. Routledge.

Kitchenham, B. A., & Pfleeger, S. L. (2002). Principles of survey research part 2: Designing a survey. *ACM SIGSOFT Software Engineering Notes*, *27*(1), 18–20.

Lima, M. d. S., David, J. M. N., & Maciel, R. S. P. (2024). Moving from remote education: Instructional design lived experiences. , 01–36.

Lima, M. d. S., & Maciel, R. S. P. (2021). Practices and digital technological resources for remote education: an investigation of brazilian professor's profile. , 225–236.

Machado, P. V. d., et al. (2022). Literacy and literacy in times of pandemic: Reports of experience during remote education. *Revista Docência e Cibercultura*, *6*(1), 01–20.

Marshall, C., Brereton, P., & Kitchenham, B. (2015). Tools to support systematic reviews in software engineering: a cross-domain survey using semi-structured interviews. In *Proceedings of the 19th international conference on evaluation and assessment in software engineering* (pp. 1–6).

Mattar, J., da Silva, K. K. A., Behar, P. A., Kenski, V., Berge, Z., Vaughan, N., ... Pedro, N. (2022). *Pharma-pandemic distance education: a glimpse into the future* (Vol. 39). Artesanato Educacional.

Medeiros, J. B. d. (2023). An analysis of remote teaching from the point of view of teachers in urban schools in a municipality in rio grande do norte: a case study.

Pulham, E., & Graham, C. R. (2018). Comparing k-12 online and blended teaching competencies: A literature review. *Distance Education*, *39*(3), 411–432.

Sampaio, R. C., & Lycarião, D. (2021). Categorical content analysis: application manual.

Souza, A. K. d. (2023). Challenges of emergency remote teaching: New teaching method-

ologies during the covid-19 pandemic in the accounting course.

Theodoro, V. E. G., & Gomes, A. S. (2022). Teachers' perceptions of the use of ict in emergency remote teaching. *Educação em Foco*, *25*(45), 227–259.

Venega, V. d. S., & Maciel, R. S. P. (2021). Requirements for development of cmooc platforms from the professional's perspective. In *Anais do xxxii simpósio brasileiro de informática na educação* (pp. 80–90).

Vieira, F. G. D. (2017). Teaching marketing through semi-structured interviews. *Revista Espaço Acadêmico*, *17*(195), 01–08.

Villarreal, M. E., Villa-Ochoa, J. A., & Galleguillos, J. (2023). Experiences of pre-service mathematics teachers during their education in times of pandemic. *ZDM–Mathematics Education*, *55*(1), 235–248.

Yin, R. K. (2016). *Qualitative research from start to finish*. Penso Editora.

Appendix A - Table of Interview Questions

Block of questions	Questions
Block 1: Respondent Profile	What is your educational background? What is your area of professional activity? What is the highest academic degree you have obtained? What teaching level do you teach? What is your age? Gender? What is your state of residence? What type of institution do you currently teach in? How long have you been teaching in RT?
Block 2: Domain Context	What level of mastery do you currently have in the teaching modality adopted in your institution? What was your routine like before the adoption of RT? And how is it nowadays? How do you perform the activities in the subject(s) you teach?
Block 3: Experience with RT	Have you had previous experience with RT (distance education) or RT? What is your opinion about the practices adopted by the institution for RT? What are the main challenges and difficulties faced in RT?
Block 4: Experience with teaching	Do you know about teaching methodologies? If so, which methodologies supported you during the RT? What were the strengths and weaknesses of the methodology(s) used?
Block 5: Application experience	Which application(s) did you use in your classes at RT? Which were the most used functionalities? Did you have difficulties? Which functionalities would you like to have in the application that does not exist yet?
Block 6: Professional experience in RT	Tell us about your institution's teaching and learning process.