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GOOGLE WORKSPACE IN ACADEMIC HEALTH INSTITUTIONS: USAGE PROFILE

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ABSTRACT

Introduction: The study investigates the use of Google Workspace in an academic health institution, highlighting the role of digital technologies in supporting remote teaching during the COVID-19 pandemic. Tools such as Google Classroom, Meet and Drive were essential for the continuity of learning. Methodology: The descriptive quantitative research analyzed Google Workspace usage data between 2021 and 2023. With a sample of 250 participants, including teachers and students, the data was anonymized and processed with Python to identify usage patterns, categorized by device type and geographic location. Results and Discussion: The results showed that 55.4% of the documents on Google Drive were shared, evidencing a collaborative culture. Google Meet excelled in synchronous classes, especially on mobile devices, with longer meetings on computers, suggesting stability and comfort in extended sessions. Documents in Google Docs format and PDFs were the most used, reflecting the accessibility of native formats. The activities were concentrated on weekdays, with peaks of use on Mondays. This data reveals that while technology provides important support for remote learning, its effective use requires ongoing training and support. Conclusion: The study demonstrates the positive impact of Google Workspace on health education, but emphasizes that the effectiveness of the technology depends on well-planned integration and regular training. Digital technology complements teaching, but does not replace the need for hybrid and flexible pedagogical methods, which integrate face-to-face and remote learning, facilitating interaction and accessibility in higher education.

Keywords: Education, Health, COVID-19 Pandemic, Google Workspace.

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INTRODUCTION

The COVID-19 pandemic has profoundly impacted several global sectors, especially education. With the need for social distancing, educational institutions had to quickly adapt to remote teaching. Emergency Remote Education (ERE) was established through Law No. 13,979, of February 6, 2020, and by MEC Ordinance No. 343, of March 17, 2020 (BRASIL, 2020a; BRAZIL, 2020b).

The transition to remote learning was challenging. Teachers and students had to adapt content and learn to use new technologies, such as cloud computing (Hodges et al., 2020; Bates, 2017; Suguimoto et al., 2017). There were difficulties such as lack of access to high-speed internet and the need for training for the effective use of educational technologies. In addition, the abrupt change in assessment methods and the need to maintain student motivation and engagement in a virtual environment were additional challenges faced by institutions (Ebner et al., 2010).

Despite these obstacles, the use of platforms such as "Google for Education" has been shown to improve the quality of remote teaching, enabling new forms of learning and interaction (Barbour, LaBonte, & Zhang, 2020). The platform offers a variety of tools that facilitate communication and collaboration between teachers and students, such as Google Classroom, Google Meet, and Google Drive. These tools allow synchronous and asynchronous classes to be carried out efficiently, promoting greater flexibility and accessibility in the teaching-learning process (Chen, Yang, & Liu, 2021). However, technology does not replace the fundamental role of teachers and human interaction in the learning process (Cuban, 2001).

Educational institutions in the area of biological and health sciences should reflect on the use of these technologies, identifying positive and negative points to improve their use. During the pandemic, the need for technological integration became evident, showing the importance of increasing the dissemination of science, training qualified teachers, and sharing knowledge with academic society (Barbour, LaBonte, & Zhang, 2020).

Technological integration is a complex process, influenced by infrastructure, educators' attitudes, and institutional support (Zhao & Frank, 2003). Technology should be seen as a means to achieve pedagogical objectives and improve learning (Cuban, 2001). The SAMR (Substitution, Expansion, Modification and Redefinition) model of Puentedura (2006) is a useful tool to evaluate the use of technology in education, promoting critical reflection on pedagogical practices. True pedagogical transformation occurs at the

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"Modification" and "Redefinition" levels, where technology allows the creation of new tasks that were previously inconceivable, providing richer and more meaningful learning (Hilton, 2016).

Blended learning combines strengths of both face-to-face and online learning, requiring careful pedagogical design (Bayne et al., 2015). The integration of technologies such as Google Meet can maximize student engagement, especially in nursing courses, where hands-on interaction is crucial. This format offers the flexibility of online learning, allowing students to access materials and activities at their own pace, while maintaining the benefits of face-to-face interactions, such as group discussions and hands-on activities.

During the pandemic, the transition to online teaching was welcomed by many medical students, who found structure and continuity in their classes through collaborative tools (Bączek et al., 2020). These tools allowed the continuity of group discussions, the review of teaching materials and the realization of case studies in a collaborative and real-time way. However, a balance is needed between digital solutions and the practical essence of medical education, ensuring that students have opportunities to develop practical skills essential to their education (Johnson & Aragon, 2003).

Bates (2017) highlights the importance of a strategic and reflective approach to integrating technology into education, emphasizing the selection of technologies aligned with pedagogical objectives, the digital competence of educators, instructional design, and new forms of assessment. The digital competence of educators is crucial to ensure the effective use of technological tools, requiring continuous training and institutional support (Ertmer & Ottenbreit-Leftwich, 2010). In addition, innovative assessment practices such as digital portfolios and formative assessments can provide more immediate and personalized feedback to learners (Grus, 2016).

This work aims to contribute to the improvement of the use of educational technologies in educational institutions, promoting a more integrated, collaborative and adaptable education to the needs of students and educators in the digital age. By exploring the best practices and challenges of technological integration, it is expected to offer practical recommendations that can be applied to maximize the benefits of these tools in the educational process, raising the quality of teaching and learning in the health area (Aguinis, Gottfredson, & Joo, 2013; Kuh & Hu, 2001).

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METHODOLOGY

This is a quantitative descriptive study, centered on the analysis of academic data associated with the use of educational support technologies, specifically the Google Workspace platform. It is important to describe how this technology has been adopted in the classroom and to identify possibilities for optimization in the delivery of teaching, the essence of educational institutions (Bates, 2017). The data were collected at a Higher Education Institution in the Health Area and consist of logs (records) of use of the Google Workspace platform, recorded in CSV format between 2021 and 2023.

The inclusion criteria of the analyzed population include professors and students of the institution's undergraduate courses, regardless of gender, and aged 18 years or older. The sample contains a number of 250 participants, encompassing a substantial representation of the faculty and students. It is noteworthy that, due to the nature of the study, the participants were not individually identified. Instead, analyses and inferences were directed to groups of data, categorized, for example, by the type of device (mobile or computer) or location of the participant (city of the institution's headquarters or other cities).

The data was analyzed using data science techniques with the Python programming language, a high-level, interpreted, scripted, object-oriented, functional, dynamically typed, and strong programming language (Python Software Foundation, 2024).

A process known as "data wrangling" was used to clean, structure, and transform the raw data into a more useful and readable format (Grus, 2016). This process involved organizing the data into a structure that could be easily analyzed. In addition, the data was anonymized, and all personal information was removed to ensure the privacy of individuals.

The data analysis was performed using data science techniques with Python and the relevant libraries (Boschetti & Massaron, 2015). The first step was the Exploratory Analysis of the Data, to determine the best approach for the subsequent analysis. The objective of the analysis was to identify trends and patterns in the use of Google Workspace tools.

Python libraries used include Pandas for data manipulation and analysis, Seaborn and Matplotlib for data visualization (Coelho, 2017), and Jupyter Notebook for documentation and code sharing (Jupyter Notebook, 2024). Python code was run in Docker containers to ensure the reproducibility of the analytics environment (Docker, 2024).

This study was registered and approved by a Research Ethics Committee (REC), under the CAAE code 66855223.0.0000.5415. In order to contextualize and enrich the

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results and the discussion, related studies in the SciELO, LILACS, MEDLINE, and IEEE repositories were consulted.

RESULTS AND DISCUSSION

In order to ensure greater argumentative clarity and a better understanding of the results obtained, it was decided to present the results and discussions in an integrated manner. This approach allows for a more in-depth analysis of the data collected, allowing for a better contextualization of the results and a more accurate interpretation of the findings. In addition, the integrated presentation of results and discussions facilitates the identification of patterns and trends in the data, contributing to the development of future research in the area.

After carrying out the work of cleaning, organizing and classifying the data provided, known as "data wrangling" (Bruce, 2019), the resulting databases were the usage records (logs) of the following Google Workspace applications: Meet, Drive and Classroom. The features of this platform have been widely used in education, and especially have been during the COVID-19 pandemic.

According to Alves, Machado and Santana (2021), the use of this type of technology has been a growing trend in education. These tools allow activities to be carried out and content delivered remotely, which has been essential to ensure access to education during the COVID-19 pandemic. Additionally, these tools can improve the quality of teaching and knowledge delivery, allowing students to access content in a more flexible and interactive way.

After performing an exploratory analysis of the data collected in this study, using descriptive statistics and data science techniques, it was possible to verify that most of the variables analyzed were of a nominal quantitative nature.

GOOGLE DRIVE

Following this line of analysis, the graph in figure 1 presents a categorization of documents based on their type of sharing. The vertical (y) axis illustrates the different levels of visibility of documents,

In the context of using "Google Drive", it was possible to discern significant patterns of behavior related to the culture of sharing and collaboration. Of the documents stored on the platform during the period analyzed, it was found that approximately 55.4% of these are

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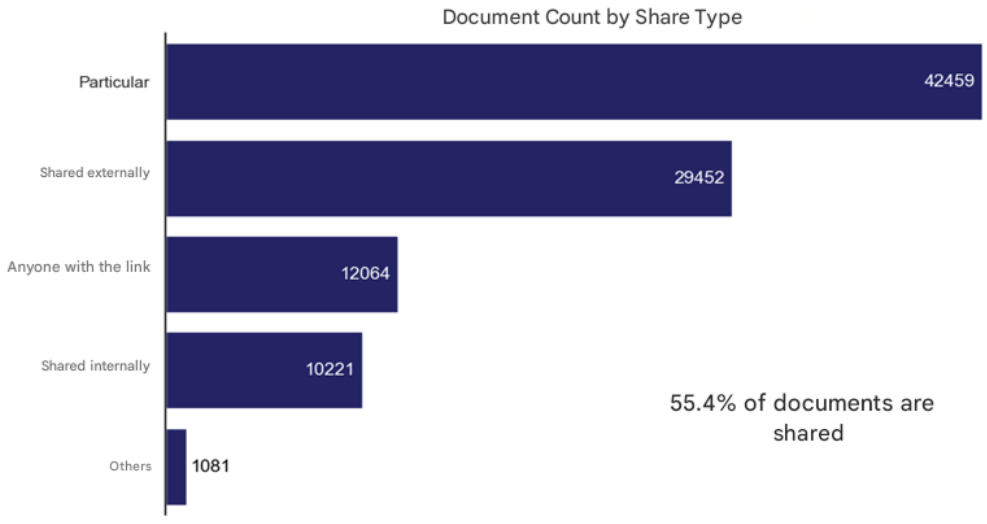
shared in some way. This prevalence of shared documents reflects a trend in the academic community to collaborate and share knowledge. Whether for educational purposes, group work, or academic discussions, this significant proportion suggests a robust and significant adoption of the platform as a collaboration tool.

According to Kumar and Skrocki (2018), students who consistently used Google Drive and Google Docs benefited from easy access to materials and real-time collaboration, which translated into tangible improvements in academic performance. This observation reinforces the idea that the platform is not only a storage tool, but also an enabler of collaborative learning.

In more detail, "externally shared" documents make up the largest sharing segment, with 29,452 records. This may indicate a continuous effort by the academic community to extend its collaboration beyond the limits of the institution, possibly with other research centers, institutions, or health professionals. On the other hand, the "Shared internally" and "Anyone with the link" documents represent 10,221 and 12,064 records, respectively, reinforcing the idea of an internal culture of cooperation.

On the other hand, the 44.6% of documents that remain in private mode, equivalent to 42,459 records, present a duality of interpretations. On the one hand, these can symbolize academic work in progress, sensitive materials that require confidentiality, or simply the individual preference of academics and students to keep certain content private. However, it also opens up a dialogue about whether there are barriers or hesitations in sharing certain materials, whether due to a lack of familiarity with the platform or intellectual property concerns.

Figure 1: Distribution of document sharing types in Google Drive.



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The graph presented in figure 2 provides a detailed count of the documents according to their respective types. The y-axis lists the different categories of documents present, while the x-axis indicates the cumulative count of these documents.

Our analysis reveals a wide range of document types stored in Drive, giving insights into teacher and student preference and use of digital tools. The predominance of "Google Docs", which leads the list with 29,870 entries, points to a marked preference for the platform's native tools. This data suggests that the simplicity, accessibility, and integration of Google Doc into the Google Education ecosystem may be responsible for its popularity.

Again, the study by Kumar and Skrocki (2018) reinforces this idea, highlighting that students who consistently used Google Drive and Google Docs not only benefited from the ease of access to materials and real-time collaboration, but this interaction also translated into tangible improvements in academic performance. Hilton's (2016) research also revealed that students who benefited from Open Educational Resources, often distributed through platforms such as Google Drive, often in PDF format, not only matched the performance of those who relied on traditional textbooks, but in some cases, outperformed them.

"PDF" files, being the second most common document type with 14,797 entries, reflect their versatile and universally accepted nature in the academic setting. Their extensive use can be attributed to the static nature of PDFs, which ensure that the document is viewed the same regardless of device or platform.

The presence of "Folders" with 12,009 entries is an indication that users are actively organizing their files in Google Drive. This number suggests that the platform is not only used for storage, but also for efficient information management, an essential skill in the digital age.

The lower numbers for files like "Microsoft Word" or "Microsoft Excel" can be interpreted in two ways. First, the preference is for native Google tools, such as Google Docs and Sheets. Second, while Microsoft tools are still used, they may be converted to Google or PDF formats for easier sharing and collaboration.

Despite the dominance of Google Docs and PDFs, a variety of other types of documents – from videos to presentations – are also present. This underlines the multifunctionality of Google Drive as an educational tool, not just limited to texts or presentations, but also providing a platform for storing and sharing multimedia resources.

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Figure 2: Types of Google Drive Documents

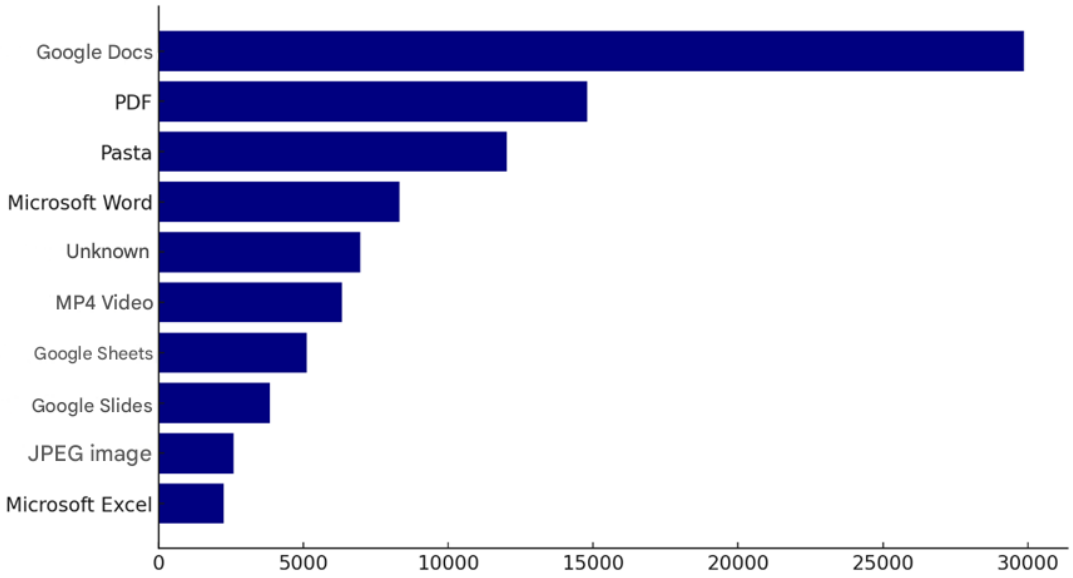

Figure 3 presents a graph that illustrates the frequency of different events or actions that occur in "Google Drive". Each event is categorized along the y-axis, with the cumulative hit count represented by the horizontal span of the bars. The graph reveals unique details about the most common activities performed by teachers and students.

The act of "Edit", with 31,615 occurrences, leads the list, indicating an intense use of Google Drive as a tool for collaborative work and continuous review. These data are, once again, in line with the results of the study by Kumar and Skrocki (2018), discussed in the previous graphs.

The "Visualize" event, accounting for 28,001 occurrences, reinforces the platform as an important resource for accessing teaching material. This high number reveals that students and teachers often turn to Google Drive to consult information, study materials, lesson plans and other pedagogical resources.

Activities such as "Download" (12,151 hits) and "Upload" (7,560 hits) represent more sporadic interactions, but still relevant. They illustrate the flow of information and resources in and out, whether for offline study or for the inclusion of new materials on the platform.

The "Sharing" event (5,837 occurrences) is particularly noteworthy. In line with the central theme of the research, the sharing reflects a collaborative academic practice, where knowledge and resources are disseminated among peers, enhancing collective learning.

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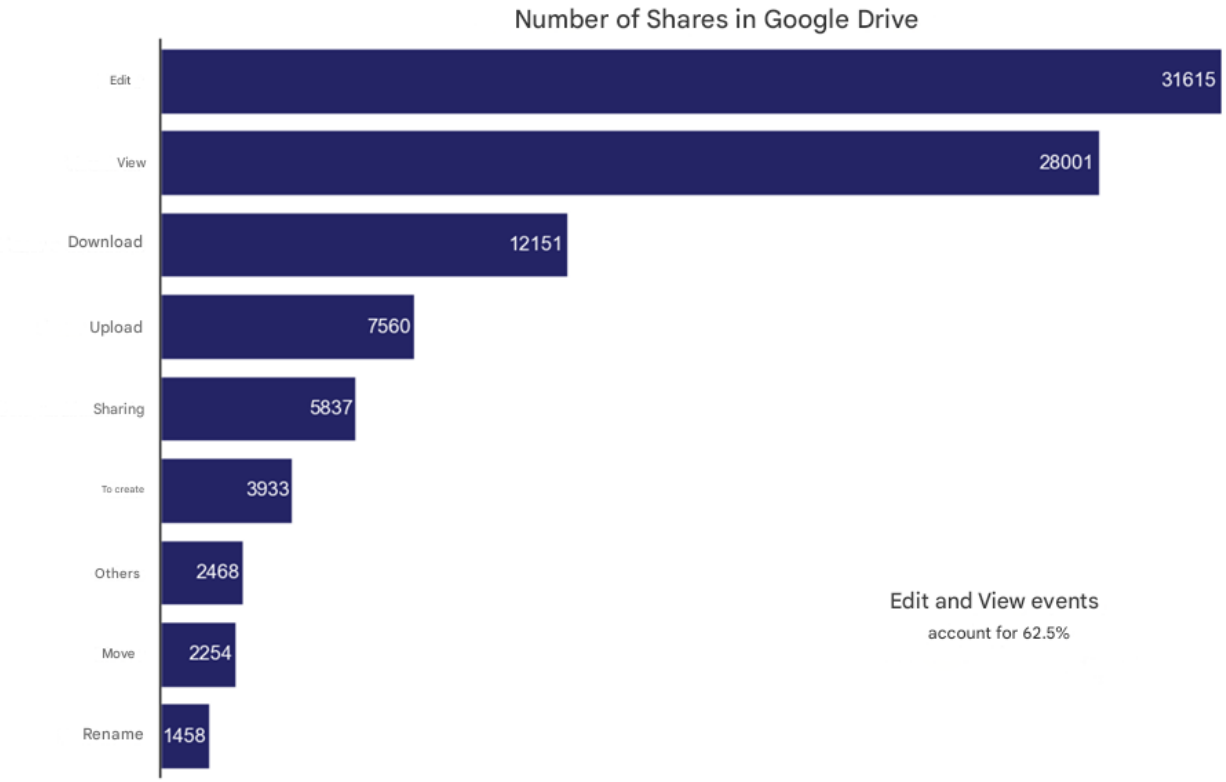
Figure 3: Highlight of the most frequent actions in Google Drive.



The graph in figure 4 illustrates the number of actions performed in "Google Drive" segregated by day of the week. To do so, the days of the week are allocated on the y-axis, and the order of days is established from "Monday" to "Sunday". The cumulative share count is represented by the horizontal extension of the bars. A distinct pattern is observed in the use of "Google Drive". There is a marked prevalence of activities during weekdays, with peaks on Monday and Thursday, adding up to 21,307 and 20,711 actions, respectively. This suggests a strong inclination towards the use of the platform on conventional school days, in line with the traditional structure of the academic week.

Weekends, on the other hand, show a significant reduction in activity, with Saturday recording just 1,982 shares and Sunday slightly more, with 7,397 shares. This decrease can be attributed to the less formal nature of these days in relation to learning and possibly to a lower tendency of students and teachers to interact with academic materials during this period.

The hybrid approach, as described by Bayne et al. (2015), seeks a harmony between face-to-face and online learning, taking advantage of the best of both worlds. In the face-to-face context, students and teachers benefit from direct social interactions, real-time discussions, and immediate feedback. On the other hand, the online component offers

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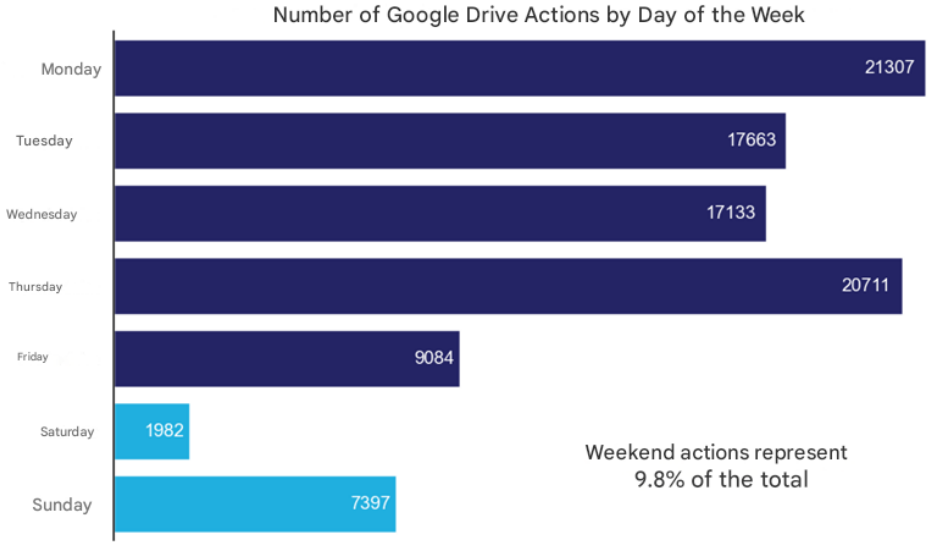
flexibility, allowing access to materials and resources anytime and anywhere. This duality may explain the patterns observed in the use of "Google Drive". During conventional school days, such as Monday and Thursday, there may be a combination of in-person classroom activities and online assignments or collaborations, reflecting the high activity on the platform. On weekends, the decrease in activity can be attributed to less face-to-face interaction and a tendency for students to disconnect from online academic activities, reserving this time for other personal or leisure activities. Thus, the hybrid approach not only shapes the dynamics of the classroom, but also influences the way digital tools, such as "Google Drive", are used throughout the week.

Figure 4: Distribution of actions in Google Drive with an emphasis on weekends.



The graph reveals a spike in activity in "Google Drive" on Monday mornings, especially at 7 a.m., suggesting checking and preparing material for the week. During weekdays, there is consistent activity between 7 a.m. and 6 p.m., with peaks at 10 a.m. and 3 p.m., indicating intensive use during business hours. On weekends, activity decreases significantly, especially in the mornings, but some use still occurs, possibly by students and teachers preparing for the week. Notably, there is continuous activity until the early hours of the morning on weekdays, suggesting use outside of traditional class hours.

The intense use of the Google Drive resource, during weekdays and during business hours, corroborates the idea that educational support technologies are deeply integrated into the academic routine of the institution in question. Again, the data speaks to the literature through the work of Kumar and Skrocki (2018), which revealed that students who consistently used Google Drive and Google Docs not only benefited from ease of access to

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materials and real-time collaboration, but this interaction also translated into tangible improvements in academic performance (Kumar & Skrocki, 2018).

During the COVID-19 pandemic, the survey revealed that the use of collaborative tools, such as those provided by the "Google for Education" suite, played a crucial role in adapting to remote teaching. The ability to access real-time information, share insights, and ask questions on platforms such as Google Classroom and Google Drive has proven to be invaluable Bączek et al. (2020).

The pattern observed in the data reflects the trends identified in the literature on the adoption of educational technologies. The integration of digital tools into the educational process, as discussed by Bates (2017), not only facilitates the delivery of content but also allows flexibility in accessing learning material.

Contemporary literature in the area of educational technologies, such as Bates (2017), emphasizes the need to integrate digital technologies into the curriculum. The widespread adoption of "Google Docs" and other digital resources at FAMERP seems to be in line with these academic recommendations, indicating a successful transition to digitized teaching methods.

The school's use of Google Drive revealed a community actively engaged in sharing practices, with the majority inclined to collaborate and share their documents. This trend not only validates the importance of the platform as an essential academic tool, but also underscores the ongoing need for training, awareness-raising, and discussions on best practices for sharing in the digital age.

GOOGLE MEET

Google Meet, developed by Google, is a video conferencing solution aimed at individual, business, and academic applications. This digital tool allows virtual meetings, online seminars and digital conferences to be held. When integrated into the Google for Education ecosystem, the platform offers advanced features such as digital content projection, automatic real-time transcription and synchronization with Google Calendar. Regarding the use of this platform, Figure 5 illustrates the average duration of meetings in Google Meet, categorized according to the "Client Type" of the participants: Web, Android and iOS. In this context, the term "client type" alludes to the device used to join the meeting: "Web" denotes access via computer, while "Android" and "iOS" represent mobile devices, such as smartphones and tablets.

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The graph and analysis of the data reveal notable differences in the average duration of meetings, depending on the type of customer (or device) used. Specifically, the "Web" category has an average meeting duration of 39 minutes, which represents a 77% longer duration compared to the average of meetings conducted through the "Android" and "iOS" categories, whose averages are 23 and 21 minutes, respectively.

This notable difference suggests a clear trend: meetings conducted via the web platform tend to be more extensive than those conducted via mobile devices. This observation can be interpreted in several ways. On the one hand, it may indicate that the web platform provides a more stable or rich experience, allowing for longer meetings. Alternatively, it may reflect a trend of faculty and undergraduate students preferring to use computers for longer sessions, while mobile devices may be more often used for quick check-ins or updates.

According to McBrien, Jones and Cheng (2009), by introducing platforms such as Google Meet in nursing courses, a potential revolution in the dynamics of teaching and learning was identified. The research not only addressed the effectiveness of the tool itself, but also looked at how a virtual learning environment can be structured to maximize student engagement and participation.

Additionally, Singh and Thurman (2019) stressed the importance of understanding the nuances of online learning, as not all implementations are the same or offer the same benefits. In the context of nursing and other health professions, the introduction of synchronized virtual environments, which allow for real-time interactions, has proven to be a valuable means of bringing students and instructors closer together.

This pattern has significant implications for the way health education institutions, such as FAMERP, approach the integration of educational support technologies into their pedagogy. The recognition that different platforms may serve different educational or communication purposes can guide strategic decisions about training, technical support, and content development.

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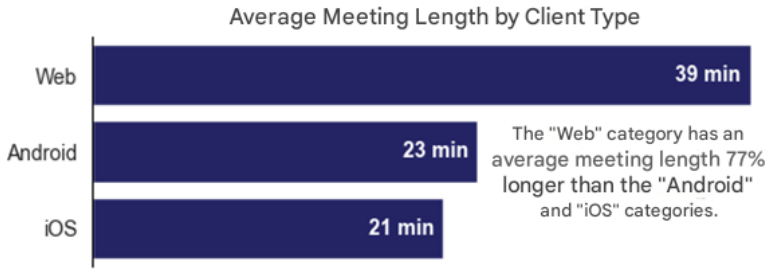
Figure 5: Average meeting duration categorized by customer type.



The chart shown in figure 6 provides valuable insights into the distribution of meeting participants based on the type of access device: Computer or Mobile Device. This distinction takes into account the platform used by users. The "Computer" category includes web access, while "Disp. Mobile covers access by Android and iOS systems.

When analyzing the graph, it is evident that devices categorized as "Computer" are predominant, with 174 users. In contrast, mobile devices, including Android and iOS, add up to 108 participants, representing approximately 38.3% of the total.

This value, although lower, is significant and perhaps should lead teachers to think about the materials to be presented on smaller screens. This is in line with the study by Zhao and Frank (2003), which discusses the Attitude of Educators and Pedagogical Transformation. The way educators perceive and adapt to technological changes can directly influence the quality of teaching and the learning experience of students.

This trend suggests several inferences:

- Nature of Platform Use: Computers, with their versatility and processing power, may be the preferred choice for teachers and students in academic activities that require more resources, such as presentations, multi-tabbed browsing, and the use of specific software. According to Kuh and Hu (2001), the interaction between the use of information technology and the integral development of the student is crucial. The study suggests that it is not just access to technology that matters, but how it is used in the educational context.
- Ergonomic Comfort: The experience of using a computer, especially in long sessions, tends to be more comfortable, with wider keyboards and larger screens.
- Accessibility and Mobility: Mobile devices, due to their mobility, are advantageous. However, the prevalence of the computer suggests that many access Google Meet from more stable locations, such as homes or offices.

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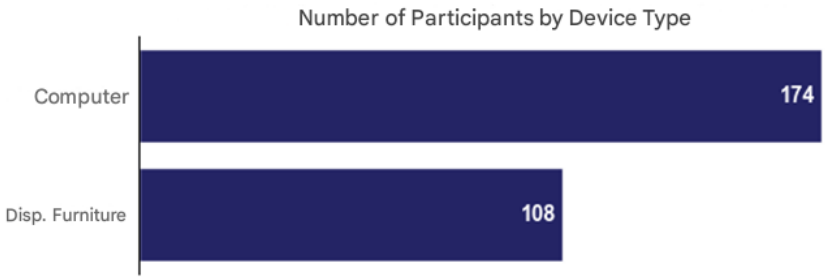
Figure 6: Distribution of participants by device type.



The quantitative analysis of meeting participants in relation to their cities of origin is presented in figure 7. In it, a distinction was made between the participants of "São José do Rio Preto" and those of other locations, grouped under the label "Others". This grouping sought to consolidate and simplify the variety of participants from different locations, allowing a direct comparison between the city in focus and the other regions. It is important to mention that individuals without the city of origin registered were excluded from this analysis.

As evidenced in figure 10, the data highlight a notable participation in Google Meet meetings, both by participants from S. J. Rio Preto and from other cities, totaling 88 and 81 participants, respectively.

In the evaluation of these data, some inferences stand out:

- Geographic Proximity vs. Technology: Technology, especially the "Google for Education" platform, has proven to be fundamental in overcoming geographical barriers. The similar representativeness of participants from both S. J. Rio Preto and other cities shows that the platform favors broad and inclusive participation, regardless of the geographic location of those involved. In this context, blended learning, which combines face-to-face and online learning, emerges as a promising solution to overcome such barriers (Bayne et al., 2015).
- Virtual Spaces in Education: McBrien, Jones and Cheng (2009) explored the use of virtual spaces, particularly in nursing courses. They identified that platforms such as Google Meet, an integral part of the "Google for Education" suite, have the potential to revolutionize the dynamics of teaching and learning. The research not only addresses the effectiveness of the tool itself, but also looks at how a virtual learning environment can be structured to maximize student engagement and participation, especially in vital fields like nursing.

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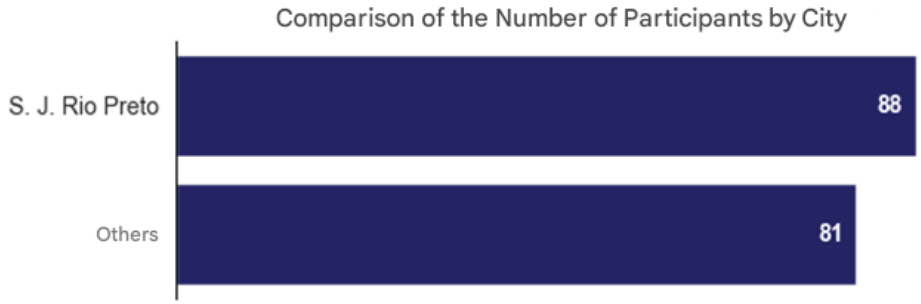
- Technological Adoption in the Health Area: The expressive participation of users both from S. J. Rio Preto and from other cities reinforces the growing adherence to the platform. Such a scenario reflects the growing need and appreciation of educational support technologies in the health area, especially in periods when distance and hybrid learning, as described by Bayne et al. (2015), gain relevance.

Figure 7: Distribution of participants: São José do Rio Preto vs. other cities.



CONCLUSION

In a global scenario transformed by the COVID-19 pandemic, education has faced unprecedented challenges, leading institutions, such as FAMERP, to quickly adapt to remote and hybrid teaching. This study sought to analyze the adoption and effectiveness of educational support technologies, focusing on Google for Education tools. Quantitative and exploratory analysis of the data revealed valuable insights into the behavior of faculty and students in relation to these tools, with Google Drive emerging as a central platform for academic collaboration.

Google Meet, Google Calendar, and Google Classroom also played significant roles, each with its own quirks and challenges. The survey highlighted the importance of technological integration in the curriculum, with FAMERP reflecting contemporary educational trends. However, despite the high adoption and perceived value of the tools, challenges persist, indicating the need for continuous training, support, and adaptation to technological changes.

Technology not only complements, but also enhances the teaching-learning processes, broadening horizons and enabling new pedagogical approaches. The analysis of the patterns of use of Google for Education tools revealed important trends, such as the search to maintain a certain normality and pedagogical proximity, even in a virtual environment.

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However, we also identified that the mere presence or use of these tools does not automatically translate into academic success. This is a crucial reminder that technology, by itself, is not a definitive solution; It must be used strategically. A resonant point in our findings is the need for continuous and appropriate training for faculty and students. Effective use of technology requires more than just superficial familiarity with the tools; It requires a deep understanding of how these tools can be integrated into pedagogical practices to optimize learning.

Finally, this research sheds light on the importance of constant reflection and adaptation in the field of education. As the world and technology continue to evolve, so too must our approach to teaching and learning. This study serves as a reminder of the complexity and multifaceted nature of education in the twenty-first century and highlights the need for holistic and informed approaches to addressing contemporary challenges.

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