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Digital Education Through a Visual Campaign to Raise Awareness of Dyscalculia in the Educational Community

Educación Digital a travez de la campaña visual de la sensibilación de Discalculia en la educación comunitaria

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Resumen

La investigación realizada está planteada con el propósito de visibilizar la discalculia como un trastorno específico del aprendizaje que, pese a su frecuencia, sigue siendo poco comprendido en el entorno educativo, a través de un enfoque interdisciplinario que articuló el diseño gráfico, la educaicón inclusiva y la comunicación digital, se creó una campaña visual educativa centrada en la plataforma NUMI y su aplicación en redes sociales, por lo que la intervención se basó en metodologías participativas, pruebas de usabilidad con niños, y un análisis reflexivo de las percepciones de padres y docentes, lo cual permitió abordar la problemática desde una perspectiva sensible, inclusiva y fundamentada, por lo que los resultados evidenciaron que el uso de recursos visuales adecuados, junto con estrategias comunicativas digitales accesibles, puede informar y también transformar la forma en que se percibe y se enfrenta la discalculia en el aula, en este sentido la campaña logró despertar interés, generar diálogo y promover una comprensión más profunda sobre las barreras que enfrentan los estudiantes que viven con este trastorno, y adicionalmente se fortalecieron competencias en alfabetización visual y se potenció el valor del diseño como herramienta educativa, por lo tanto este trabajo demuestra que el diseño gráfico, cuando se aplica con enfoque social y colaborativo, tiene la capacidad de influir en el cambio educativo y generar impactos significativos a nivel comunitario.

Palabras clave: Discalculia, Diseño Gráfico Educativo, Inclusión, Alfabetización Visual, Campaña Digital.

Abstract

The research carried out is raised with the purpose of making dyscalculia visible as a specific learning disorder that, despite its frequency, is still poorly understood in the educational environment through an interdisciplinary approach that articulated graphic design, inclusive education and digital communication, an educational visual campaign was created focused on the NUMI platform and its application in social media. The intervention was based on collaborative methodologies, usability tests with children and a reflective analysis of the perceptions of parents and teachers, which allowed managing the problem from a sensitive, inclusive, and informed perspective. The results demonstrated that using appropriate visual resources along with accessible digital communication strategies can inform and also transform the way in which dyscalculia is perceived and handled in the classroom. In this aspect, the campaign managed to motivate interest, generating dialogue and promoting a deeper understanding of the barriers faced by students living with this disorder. In addition, visual literacy competencies were strengthened, enhancing the value of design as an educational tool. Thus, the results demonstrated that the use of appropriate visual resources, along with accessible digital communication strategies, can inform and also transform the way in which dyscalculia is perceived and confronted in the classroom, generate dialogue and promote a deeper understanding of the barriers faced by students living with this disorder, furthermore, strengthened visual literacy skills enhancing the value of design as an educational tool, therefore, this research shows that graphic design, when applied from a social and collaborative perspective can influence educational change and generate significant impacts at the community level.

Keywords: Dyscalculia, Educational Graphic Design, Inclusion, Visual Literacy, Digital Campaign.

Introduction

In the current educational landscape, the inclusion of students with different learning needs has become a fundamental pillar. One of the emerging challenges in this context is addressing dyscalculia, a specific learning disorder that affects the ability to understand and manage numerical concepts, and manifests as persistent difficulties with basic math skills such as number sense, memorization of arithmetic operations, accurate calculation, and mathematical reasoning. Although common, it is estimated to occur in approximately 5% to 8% of the school population, which implies that in a classroom of 30 students, two may present dyscalculia (University of Colima, 2022). Dyscalculia often goes unrecognized or is mistaken for a lack of aptitude in mathematics. This lack of awareness in the educational community leads to delays in diagnosis and support interventions, as there is a cultural assumption that “math is hard” and that the child simply “isn’t good with numbers.” Thus, addressing dyscalculia from an inclusive perspective is imperative. Timely identification of students with dyscalculia and the provision of appropriate pedagogical strategies help prevent their exclusion or misinterpretation within academic settings (University of Colima, 2022).

Aware of this challenge, visual literacy emerges as a strategic tool in modern educational campaigns. Visual literacy refers to the set of competencies that enable individuals to interpret, evaluate, use, and create images and visual messages effectively, equipping them with skills to process the overwhelming amount of graphic information in today's society. Especially in the digital era, where images dominate communication, these skills are essential for both educators and learners. A strong foundation in visual literacy within the educational community facilitates understanding of complex content through infographics, videos, illustrations, and other visual resources. This makes educational graphic design the language through which ideas and data are transmitted in an accessible and inclusive way by using visual materials to explain what dyscalculia is, how to detect it, and how to support students affected by it, more clearly and empathetically than text alone. Likewise, digital marketing contributes strategies to widely disseminate these materials and generate social impact.

Kotler and Armstrong, 2022), emphasize that “in the digital age, marketing campaigns for educational products should have a comprehensive approach that combines awareness of specific learning problems with available technological solutions”, which involves bringing together different channels, social media, blogs, email and educational platforms into a visually appealing and coherent campaign. This is demonstrated in this position that is supported by several studies, which emphasizes the need to plan an effective educational digital marketing strategy. This combines inbound and outbound marketing tactics is recommended, that is, useful content that naturally attracts users combined with active promotional efforts, to achieve greater impact and trust (Chaffey & Ellis-Chadwick, 2019). That is confirmed by the development of quality educational content, such as infographics, explanatory videos or e-books on dyscalculia, which are considered one of the most effective strategies to attract attention and encourage user participation. According to several EdTech industry studies highlights that these resources can achieve conversion rates of over 45% in lead generation when they address specific learning issues. Therefore, the combined role of graphic design and digital marketing in raising awareness lies in translating pedagogical and scientific knowledge about dyscalculia into comprehensible, visually literate formats that inform and encourage action among teachers and families (García-López, 2022).

Given this context, the justification for this research is grounded in the urgent need to bring visibility to a problem that, while affecting a significant number of students, remains underestimated in educational systems. As various studies have shown, there is still a notable lack of awareness and sensitivity regarding this specific learning disorder. This leads to educational environments that are ill-prepared to detect and address it in a timely manner (University of Colima, 2022). Because of this informational gap, many cases go unidentified, leading to late diagnoses, the use of inappropriate teaching methods, and even subtle forms of exclusion that put students at a disadvantage in regular classrooms (Matamoros Cázares & Agramonte Rosell, 2024). Although inclusive education posits that all students should have the conditions necessary for development regardless of their capabilities or difficulties, achieving this principle in practice requires more than good intentions; it demands concrete awareness and training actions directed at the entire educational community (De la Fuente González, Menéndez Álvarez-Hevia, & Rodríguez-Martín, 2025).

In this regard, the proposal to design a digital visual campaign responds to a global trend in the use of technology for education and also addresses a specific need in the Latin American context, where awareness of dyscalculia is still limited. In countries like Ecuador, there is an urgent need to generate campaigns that increase awareness of this condition, as most teachers and parents lack clear information and accessible resources to deal with it (University of Colima, 2022). Therefore, a well-designed campaign has the potential to empower educational stakeholders by providing practical tools to guide early identification, suggest effective support methods, and promote empathetic school environments.

From the perspective of educational social marketing, such interventions help build a new narrative around neurodiversity, breaking down common prejudices—such as the idea that difficulties with math are solely due to a lack of effort or motivation (Gómez-Marí, Sanz-Cervera, & Tárraga-Mínguez, 2021). Thus, the value of this research lies in its dual impact: on one hand, it helps fill an informational and awareness gap in the educational community; and on the other, it lays the groundwork for a replicable intervention model based on accessible graphic design and educational digital marketing strategies that can be adapted to different school contexts. By integrating visual communication theories with inclusive pedagogical approaches, this project aims to demonstrate that a well-executed digital campaign can transform practices and attitudes, helping to create a more just, prepared, and understanding educational environment for students with dyscalculia.

Under these circumstances, the research proposes a general objective focused on designing and implementing an educational visual digital campaign aimed at raising awareness about dyscalculia in the educational community, promoting the inclusion of students who present this disorder. To achieve this goal, two specific objectives have been proposed to guide the work: first, to analyze the level of knowledge and current perceptions that teachers and parents have about dyscalculia (establishing a baseline of awareness); second objective, to develop inclusive and educational graphic materials such as infographics, videos, and interactive resources that explain in an accessible way what dyscalculia is, how to detect it early, and how to support students who present it; and third objective, likewise, to guide the research, the following questions are posed: What is the level of awareness about dyscalculia among members of the educational community, and how can it be improved through a visual digital campaign? How do educational graphic design and digital marketing strategies contribute to raising awareness and educating teachers and families

about dyscalculia? What characteristics should an inclusive visual digital campaign have in order to achieve a significant impact on the understanding and attitude of the educational community regarding dyscalculia? These questions will guide data collection and the evaluation of results, directly connecting with the stated objectives.

Materials and Methods

Methodological Approach

Recognizing the importance of bridging theory and practice, this research adopts the Design-Based Research (DBR) approach, an innovative and flexible methodology that combines practical development of educational solutions with the generation of applicable theoretical knowledge. DBR is particularly suited for complex educational contexts where the goal is to design, implement, evaluate, and refine an intervention, a digital visual educational campaign focused on raising awareness about dyscalculia which based on the real needs of the educational community. DBR operates through iterative cycles that collect data during the intervention process, analyze results, validate in real contexts, and refine the design based on feedback (Anderson & Shattuck, 2012).

To structure the intervention, an applied methodology was developed that integrated phases of validation, participatory design, audience segmentation, and the execution of digital marketing actions aimed at promoting the visibility of the educational application NUMI. The methodology allowed for coherent progress aligned with the research objectives, articulating inclusive graphic design with effective communication strategies.

In the first phase, a content validation was carried out with experts in the educational field, which aligns with the principle of active participation characteristic of the DBR approach. The meeting was held synchronously via videoconference (Zoom) with educators specializing in Educational Sciences, to whom the collected information about dyscalculia and the first content prototypes were presented. As a result, observations were obtained aimed at improving the conceptual clarity, pedagogical relevance, and visual accessibility of the materials intended for families and teachers.

Subsequently, a segmentation of the target audience was defined, taking into account demographic, psychographic, and geographic variables, highlighting as the primary audience fathers and mothers between the ages of 30 and 45, residing in Riobamba, Quito, Guayaquil, and Cuenca, with a strong

interest in their children's education and an openness to incorporating technological tools into their family practices. Complementarily, a secondary audience was identified, consisting of proactive educators between the ages of 25 and 55, interested in inclusive methodologies and digital learning support resources. This segmentation was key to adjusting the tone, format, and distribution channels of the educational content.

Finally, the intervention was evaluated through accessibility and usability tests applied to a sample of potential users of the digital game. These tests focused on fundamental aspects of inclusive visual design, such as typographic legibility, color choices, spatial organization of elements, and interaction adapted to the needs of children with dyscalculia. The feedback obtained allowed for immediate adjustments to the prototype, which were validated before final dissemination, thus complying with the iterative principles of the DBR methodology.

Material

Table #1
Methodological Stages

Stages	**Actividades clave**	**Instrumentos utilizados**	**Resultados esperados**
1. Problem analysis and validation	Meeting with an education expert to validate content on dyscalculia and the proposed application	Interviews, Zoom meeting, expert validation	Content validation and pedagogical alignment
2. Participatory design of the intervention	Design of accessible graphic materials (ebook, landing page, NUMI app) based on UDL principles and inclusive design	Figma, Canva, WCAG and UDL principles	Functional and accessible graphic prototype
3. Target audience segmentation	Definition of the primary audience (parents aged 30–45) and secondary audience (teachers aged 25–55) according to demographic and	Google Forms, sociodemographic profiles	Clear segment for message and media design

	psychographic variables		
4. Implementation of the digital campaign	Application of inbound strategies (content, blog, SEO, landing page) and outbound strategies (social media, ads, email marketing)	Meta Business Suite, TikTok Analytics, mailing platforms	Effective dissemination, lead generation, visibility.

Source: Researchers

Figure #1
Interview

Interview Guide with an Education Expert

Objective: Validate educational content on dyscalculia and obtain pedagogical recommendations for the NUMI application.

1. Questions

    1. How would you describe the importance of early detection of dyscalculia in the classroom?
    2. What aspects do you consider essential when designing inclusive digital materials for students with dyscalculia?
    3. What recommendations would you give to involve parents in the support process?
    4. What indicators would you suggest to evaluate the impact of a digital awareness campaign?
    5. Do you observe frequent institutional barriers that hinder the inclusion of students with dyscalculia?

2. Expert Validation Record (or meeting via Zoom)

Date: _____ Time: _____ Platform: Zoom

Expert participant: Lic. Darwin Soria – Specialist in Educational Sciences

Summary of Recommendations:

- Ensure clear and appropriate terminology for a non-specialist audience.
- Incorporate visual examples that represent basic mathematical operations.
- Adjust contrast and typography to improve readability on mobile devices.

Researcher's Signature: _____

Expert's Signature: _____

Figure 2

Diagnostic Questionnaire

Diagnostic Questionnaire (Google Forms)

Objective: To assess the level of knowledge and perceptions about dyscalculia in the educational community.

Questions (Likert-type or multiple-choice responses):

1. Have you heard the term "dyscalculia" before? (Yes / No)
2. Rate your level of knowledge about specific math difficulties (1–5).
3. Do you believe dyscalculia can be identified in primary education? (Yes / No / Not sure)
4. Mark the symptoms you associate with dyscalculia (difficulty remembering multiplication tables, symbol confusion, etc.).
5. Would you like to receive digital resources to support students with dyscalculia? (Yes / No)

Table 2

Accessibility for Digital Materials

Accessibility	**Complies / Needs Improvement**
Minimum color contrast of 4.5:1 for text and background (WCAG 1.4.3).	
Sans-serif font, preferably 16 pt or larger on mobile (UDL principle of representation).	
Text alternatives (alt text) for key images.	
Accessible playback controls for videos (subtitles and pausable playback)	
Consistent and coherent navigation across screens (WCAG 2.4.5)	

Source: Researchers

Results

According to the data collected after the diagnostic questionnaire was applied, 20% of parents and 25% of teachers were familiar with the term *dyscalculia* before the intervention. Additionally, frequent confusion was identified between this disorder and general difficulties in mathematics, which underscores the need for an educational campaign aimed at strengthening basic knowledge within the educational community.

This initial lack of awareness aligns with findings from previous studies, which indicate that dyscalculia is one of the most underestimated learning disorders in the school environment due to its low visibility and the lack of specialized teacher training (Matamoros Cazares & Agramonte Rosell, 2024; Universidad de Colima, 2022). This gap limits the possibility of timely detection and perpetuates the stigma that difficulties in mathematics are solely due to a lack of effort or ability.

Table # 4
Knowledge about dyscalculia

Item (Likert 1–5)	Parents (n=20)	Teachers (n=12)
I know what dyscalculia is	2,1	2,4
I can identify at least 3 symptoms	1,9	2,2
I know where to find support resources	2,0	2,3

Source: Researchers

Regarding the knowledge assessment of dyscalculia, a total of 10 parents and 6 teachers completed the pre-campaign questionnaire. A projection was also made in order to evaluate the effectiveness of the strategy after its implementation.

Table # 5

Dyscalculia knowledge evaluation

Variable	Current knowledge (%)	Expected increase (%)
Definition of dyscalculia	25 %	+60
Recognition of 3 symptoms	20 %	+50
Identification of useful resources	30 %	+50

Source: Researchers

In this context, the usability and accessibility evaluation of the NUMI prototype was conducted with 8 children aged 8 to 10 years, all with a confirmed diagnosis of dyscalculia and receiving support at the CEOS psycho-pedagogical clinic. The results showed an average System Usability Scale (SUS) score of 84/100, which is considered excellent. In addition, the accessibility checklist (based on WCAG 2.2) revealed a 92% compliance with “AA” level criteria, also regarded as excellent according to digital usability standards (Brooke, 1996). To achieve this, adjustments were made related to the inclusion of alternative descriptions in some images. These tests highlight the

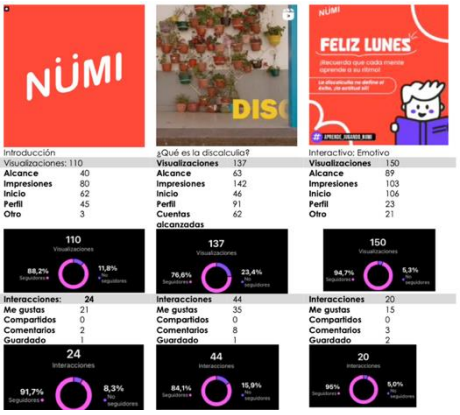
importance of applying universal design criteria for learning and digital accessibility, as indicated by (De la Fuente González, et.al, 2025).

The digital marketing proposal was segmented into two main areas such as inbound and outbound marketing based on best practices in the digital education sector, according to (Chaffey and Ellis-Chadwick 2019). It emphasizes that the successful implementation of a digital marketing strategy requires a clear methodology with a structure that integrates both inbound and outbound, especially in educational products, where credibility and added value are crucial to generating conversions (p. 89).Therefore, the inbound approach included the production of original educational content through a specialized blog, the creation of downloadable materials such as an informative ebook on dyscalculia, the organization of free webinars, and SEO optimization with relevant keywords.In addition, a landing page was developed with the purpose of converting visits into registrations, giving access to the NUMI application and complementary resources.

This section presents the results of post metrics, where the objective was to educate the target audience on the problem, starting with brand awareness followed by a sequence of educational content on dyscalculia.

Figure 3

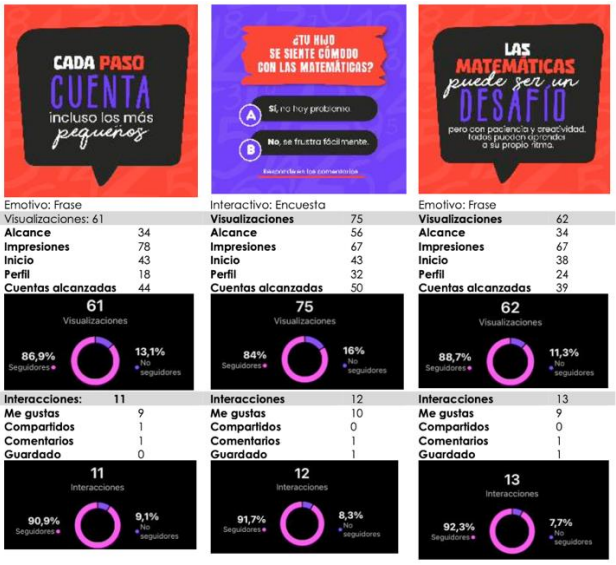
Instagram Metrics



Source: Researchers

The goal of these posts was to communicate the available solutions without risking the marginalization of children with dyscalculia, using educational and motivational messages.

Figure 3
Instagram Metrics



Source: Researchers

During the Instagram strategy implementation, the account reached a total of 53 followers, with 13 posts and 2 reels published throughout the analysis period. One highlighted content piece was an interactive poll, which reached 56 accounts, 67 impressions, 43 homepage visits, 32 profile visits, and a total of 50 accounts reached. This post received 10 likes, 1 comment, 1 save, and 0 shares. Another emotional content piece—a motivational quote—achieved a reach of 34 accounts, 67 impressions, 38 homepage visits, 24 profile visits, and 39 accounts reached, with 9 likes, 1 comment, 1 save, and no shares.

As for overall reel performance, views of 61, 75, and 62 were recorded, respectively, with an average of 12 interactions per piece (11, 12, and 13 individual interactions). From an aesthetic and communicational standpoint, the visual identity remained coherent, supported by a chromatic mosaic layout that brought harmony to the feed. The content was structured progressively, starting with educational introductory posts for new users, complemented by fun facts and motivational quotes from the education field to capture attention and strengthen the connection with the digital community.

Figure 3

Analysis of successful posts

Instagram		Facebook		Tik Tok	
					
Emotivo: Frase		Interactivo: Encuesta		Emotivo: Frase	
Visualizaciones: 707		**Visualizaciones**	75	**Visualizaciones**	252
Alcance	68	**Alcance**	56	**Alcance**	34
Impresiones	80	**Impresiones**	78	**Impresiones**	67
Inicio	34	**Inicio**	43	**Inicio**	38
Perfil	25	**Perfil**	32	**Perfil**	24
Cuentas alcanzadas	79	**Cuentas alcanzadas**	65	**Cuentas alcanzadas**	39
Interacciones:	**78**	**Interacciones**	53	**Interacciones**	13
Me gustas	27	**Me gustas**	14	**Me gustas**	22
Compartidos	0	**Compartidos**	0	**Compartidos**	0
Comentarios	0	**Comentarios**	1	**Comentarios**	0
Guardado	0	**Guardado**	1	**Guardado**	1

Source: Researchers

An analysis of the results shows how each platform: Instagram, Facebook, and TikTok, tells a different story about user behavior in response to shared content. On Instagram, there were 707 views, with a reach of 68 and 78 impressions, indicating acceptable visibility. However, closer examination reveals low engagement: 27 likes and no comments. This may suggest that although the content is being seen, it is not resonating deeply. The aesthetic might attract, but something is missing to spark comments, shares, or saves.

On Facebook, the outlook shifts slightly: 75 views, 56 reach, and the same 78 impressions as Instagram. Interestingly, engagement was slightly better with 14 likes and 1 comment. While still a low volume, it suggests that the content might be emotionally connecting better with this audience.

On TikTok, 252 views were recorded, with 34 reach and 67 impressions. Engagement was positive, with 22 likes and 1 save. Although it reached fewer people, it strongly resonated with those who saw it. It's evident that platforms behave differently—each with its own rhythm, tone, and way of engaging users. Instagram provides visibility; Facebook seems to respond better to emotional content; and TikTok emerges as a powerful channel for authentic engagement, albeit with lower reach. This analysis highlights the strategic importance of adapting content to each network's

unique characteristics as a way of respecting how people live, feel, and interact in different digital spaces.

Discussion

The results obtained throughout this research invite us to look beyond numbers and focus on how people connect with educational content when they encounter it on a screen. While the metrics on reach and views show that the campaign was seen by hundreds of people, interaction levels speak more honestly about what users actually felt, thought, or wanted to share upon viewing the content. This reinforces what was proposed by Traboco et al. (2022), who argue that visibility does not guarantee understanding or impact, and that to achieve real educational effects, it is necessary to generate emotional connection through visual resources that are meaningful and relatable to the audience.

This research has revealed results that suggest looking at what lies behind the numbers and analyzing how people relate to educational content when they see it on a screen. Although the metrics reveal that the campaign was viewed by many people, the levels of interaction reveal more clearly what users intended to share, this supports Traboco et al. (2022), who report that seeing something does not suggest that it is understood or that it has a real impact. Therefore, in order to achieve an authentic educational effect, it is essential to stimulate an emotional connection through visual resources that are relevant and close to the audience. In the social media platform TikTok, a direct narrative was identified typical of this platform, which allows even with less reach and open spaces for dialogue. This behavior coincides with recent studies such as that of (Ailawadi and Nagpal, 2023), where it is stated that the success of educational content in social media depends on the suitability of the format to the logic and language of each platform. Focusing on Instagram, a high level of views was observed, but a low rate of active responses. This can be explained by the concept of “passive content consumption” defined by (Kaplan and Haenlein, 2020). This idea is a common phenomenon in visual platforms where users tend to scroll quickly through posts without stopping to comment or share unless the content strongly catches their attention or connects with their emotions or personal experiences. Likewise, Facebook, even with limited coverage, allowed noticing a close interaction with comments and genuine interest from a more adult audience. It is in line with the findings of (Kaur and Chahal, 2020), who emphasize that this social

media is still useful for educational campaigns aimed at parents or guardians, especially when the content is presented with sensitivity and transparency.

From a pedagogical point of view, the results show that graphic design based on accessibility principles, such as those of Universal Design for Learning (UDL), conveys information, and also provokes emotions and stimulates the curiosity of the public, as indicated by (Mendoza Ureta and Tejeda Díaz, 2023). It has been recognized that visual literacy is fundamental for important educational communication, especially in contexts where technical language can be an obstacle to inclusion. In this way, a digital educational campaign besides informing, should aspire to generate experiences. This requires reflecting with intention on the emotions we wish to evoke in people, the formats that inspire each audience, along with how we can communicate complex concepts, such as dyscalculia, in accessible, visual and human messages. Thus, this integrative approach responds to a communicational need and also to an ethical commitment to educational inclusion, that begins when we decide that everyone has the right to understand and participate.

Conclusions

The development of this visual digital educational campaign on dyscalculia demonstrated that well-oriented inclusive graphic design and digital marketing strategies have a positive impact on raising awareness within the educational community. The research confirmed a previously low level of knowledge about the disorder among both parents and teachers, reaffirming the urgent need to create accessible, visually engaging, and pedagogically grounded materials that clearly explain what dyscalculia is and how it can be effectively addressed.

The results obtained from both the questionnaires and digital interaction metrics showed that the campaign succeeded in capturing the target audience's attention, sparking interest in learning more, and encouraging commitment to inclusive educational practices. The NUMI platform, the visual resources created, and the strategic use of social media platforms such as Instagram, TikTok, and Facebook facilitated an empathetic, accessible, and tailored learning experience for teachers, families, and students.

Moreover, it was demonstrated that the combination of visual literacy and digital tools not only disseminates information but also transforms attitudes and promotes a fairer educational

environment. This was evident through the incorporation of accessibility principles, usability testing with children diagnosed with dyscalculia, and a sensitive communication approach, which contributed to generate a meaningful and replicable intervention.

This experience highlights that educational graphic design, when articulated with digital communication strategies and guided by an inclusive approach, has transformative potential in how dyscalculia is understood and addressed in school contexts. The active participation of the educational community, combined with the visual and narrative sensitivity of the content, allowed not only for information sharing but also for the generation of empathy and action.

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