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TikTok as an Auxiliary Tool in Learning the Concept of Fractions in 6th-Grade Elementary School

TikTok como Auxiliar na Aprendizagem do Conceito de Fração no 6º ano do Ensino Fundamental

TikTok como ayuda en el aprendizaje del concepto de fracciones en sexto grado de escuela primaria

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Abstract
This article investigates TikTok as an auxiliary tool in teaching the concept of fractions to 6th-grade students in elementary school. Motivated by recurring difficulties in understanding this concept, the research adopted a qualitative and exploratory approach grounded in theories of mathematics education and the cognitive theory of multimedia learning (CTML). Data was collected from videos produced by the students, interviews, and classroom observations. The results indicate that using TikTok increased student engagement and improved their understanding of fractions, demonstrating the effectiveness of this platform as a dynamic pedagogical resource connected to students' realities. We highlight the importance of embedding digital technologies into contemporary teaching and suggest future investigations into the long-term impacts on different mathematical concepts and teachers' perceptions of the usefulness of this tool in learning.
Keywords: TikTok. Concept of Fractions. Learning. Elementary School.

Resumo
Este artigo investiga a utilização do TikTok como ferramenta auxiliar na aprendizagem do conceito de fração para alunos do 6º ano do Ensino Fundamental. Motivados por dificuldades recorrentes na compreensão desse conceito, a pesquisa adotou uma abordagem qualitativa e exploratória, fundamentada nas teorias da Educação Matemática e na Teoria Cognitiva da Aprendizagem Multimídia (TCAM). A coleta de dados foi realizada por meio da produção de vídeos pelos alunos, entrevistas e observações em sala de aula. Os resultados indicam que o uso do TikTok não apenas aumentou o engajamento dos alunos, mas melhorou sua compreensão em relação ao conceito de fração, demonstrando a eficácia dessa plataforma como um recurso pedagógico dinâmico e conectado à realidade dos estudantes. Destacamos a importância de integrar tecnologias digitais no ensino contemporâneo e sugerimos investigações futuras dos impactos a longo prazo em diferentes conceitos matemáticos e a percepção dos professores acerca da utilidade dessa ferramenta na aprendizagem.
Palavras-chave: TikTok. Conceito de Fração. Aprendizagem. Ensino Fundamental.

Resumen
Este artículo investiga la utilización de TikTok como herramienta auxiliar en el aprendizaje del concepto de fracción para alumnos de 6º grado de Educación Primaria. Motivados por dificultades recurrentes en la comprensión de este concepto, la investigación adoptó un enfoque cualitativo y exploratorio, fundamentado en las teorías de la Educación Matemática y en la Teoría Cognitiva del Aprendizaje Multimedia (TCAM). La recolección de datos se realizó mediante la producción de videos por parte de los alumnos, entrevistas y observaciones en el aula. Los resultados indican que el uso de TikTok no solo aumentó el compromiso de los alumnos, sino que mejoró su comprensión del concepto de fracción, demostrando la eficacia de esta plataforma como un recurso pedagógico dinámico y conectado a la realidad de los estudiantes. Destacamos la importancia de integrar tecnologías digitales en la enseñanza contemporánea y sugerimos

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investigaciones futuras sobre los impactos a largo plazo en diferentes conceptos matemáticos y la percepción de los docentes acerca de la utilidad de esta herramienta en el aprendizaje.
Palabras clave: TikTok. Concepto de fracciones. Aprendizaje. Escuela primaria.

1. Introduction

Students' perception of mathematics as a complex and abstract subject has led those with an inherent difficulty with the curriculum content to develop an aversion to it. This limited view often reduces the importance of mathematics to the school environment, where its purpose seems to be just to get a grade to "succeed" in the subject. However, it is essential to understand that mathematics goes beyond this superficial perspective.

Mathematical knowledge, including fractions, originates from solving measurement problems and the need to accurately represent these measurements (Witt, 2018). Although recognized as one of the fundamental concepts in elementary education (Moreira, 2020), understanding and applying fractions continues to challenge students throughout their educational journey.

Adapting the classroom by embedding technology is a timely measure since the traditional teaching model often does not correspond to the preferences of the connected generation (Borba; Xavier, 2022). Today's students are inclined to learn and build knowledge in a practical, interactive, fun, and collaborative way (Monteiro, 2020). Therefore, providing resources and stimuli that incorporate new educational methods and approaches inside and outside the school environment is essential.

In this context, the social network TikTok emerged and was widely used during the COVID-19 pandemic to disseminate disciplinary content (Monteiro, 2020), proving to be an auxiliary tool in the educational context, especially in student engagement (Borba; Xavier, 2022). Furthermore, TikTok can transform concepts, such as fractions, into more accessible and attractive formats, facilitating students' understanding and retention of knowledge (Monteiro, 2020).

Given this scenario, this research sought to answer the following question: What difficulties do 6th-grade elementary school students face in learning fractions, and how can we minimize them with the help of social media TikTok?

The objective was to investigate students' difficulties in understanding the concept of fractions and propose strategies, such as using the TikTok app to aid learning. We explore some theoretical references that address students' difficulties in learning the concept of fractions and present the TikTok interface and how it can be used as an educational resource in mathematics classes, especially in learning the concept of fractions.

2. Theoretical Framework

Fractions are one of the most important mathematics topics in elementary education, and they challenge many students during their school lives (Moreira, 2020). A significant part of these difficulties are associated with methodologies and teacher education (Witt, 2018).

According to Parracho Sant'Anna and Mandarino (2022), teachers in the early years, most of whom have degrees in pedagogy, generally introduce fractions to students but face difficulties due

to limited academic education in this field. They acquire practical knowledge through experience, collaboration, and continuing education.

When problematizing the difficulties students present when studying mathematical concepts, we observe that, in traditional mathematics classes, students are first taught the theory. Then, they are asked to solve some exercises and problems with more or less algorithmic solutions using the same reasoning and rarely connected with real-world activities.

According to Stoica (2015), our society has a pre-established perception that mathematics is a complex subject, which means that students often express aversion to it, even if they have not yet had the experience of learning mathematics. This happens, for example, when we approach the concept of fractions, which teachers and students alike fear.

We realize that learning the concept of fractions can be challenging for students due to the complexity and the way the concept is approached. Furthermore, attitudes toward mathematics and fractions can impact students' performance on conceptual problems involving this content.

According to the Parâmetros Curriculares Nacionais [National Curriculum Parameters] (Brasil, 1997, p. 102), the teaching of the concept of fractions must address:

> The interpretation of the fraction as a part/whole relationship assumes that the student can identify the unit that represents the whole, understands the inclusion of classes, and knows how to perform divisions operating with discrete or continuous quantities (Brasil, 1997, p. 102).

The most common practice in classes with the concept of fractions is to use situations in which the part/whole relationship is implicit; that is, it applies to the traditional division of chocolate or pizza into equal parts.

In the Base Nacional Comum Curricular (BNCC) [National Common Curriculum Base] (2018), the content of fractions in the 6th grade must address meanings (part/whole, quotient), equivalence, comparison, addition and subtraction, calculation of the fraction of a natural number, addition and subtraction of fractions, multiplication or division of fractions. Thus, we realize that the part/whole relationship must be taught, however, providing connections with the student's reality:

> It is also important to consider that learning a particular concept or procedure requires a meaningful context for students, not necessarily from everyday life but also from other areas of knowledge and the history of mathematics. However, they must develop the ability to abstract the context, grasping relationships and meanings to apply them in other contexts (Brasil, 2018, p. 72).

Mathematics should be taught whenever possible with connections to the student's social context; it is more complicated to make this link to some contexts, but there are abstract examples for some. Examples of using the concept of fractions should not only be part/whole situations.

In this regard, the teacher should not prioritize only the representation. Nunes and Bryant (2020) criticize the strong tendency to prioritize the part/whole meaning when working with fractions and that this way of presenting the subject to children can, indeed, lead to errors. In other words, if the chosen teaching method focuses only on this meaning, learning will be weakened.

Witt (2018) highlights that the traditional teaching of fractions in public schools through drawings of pizza or chocolate is often mechanical and disconnected from the students' reality. To improve understanding, the author suggests that problems related to students' daily lives make learning more relevant and understandable.

Thus, we observe that other difficulties contribute to misunderstandings of mathematics. Sánchez (2019) emphasizes that we can recognize and notice them, mainly when teaching the concept of fractions, and they can manifest themselves in the following aspects:

> Difficulties with cognitive development and the construction of mathematical experience, the acquisition of basic notions and numerical principles, the acquisition of numbers, and the practice of basic operations regarding the mechanics or understanding of the meaning of operations. Difficulties in problem-solving, which imply understanding the problem, understanding and ability to analyze the problem and reason mathematically (Sánchez, 2019, p. 174).

This difficulty in learning mathematics occurs for several reasons, including negative past experiences with the subject. How mathematics is taught can affect how students feel about it and, in turn, influence their performance at all levels of education.

The methodology used plays an essential role in the impact on students and may contribute to the development of an aversion to mathematics, called by Papert (2019) "mathophobia." This aversion, in turn, is associated with an increased incidence of failures at various levels of education.

We understand that fractions are used in the most diverse situations in our daily lives. This fact can be explored in the classroom through several strategies, and TikTok can link students' reality and the content. By considering TikTok as an educational resource, we open up possibilities to make learning more contextualized and engaging.

Below, we discuss TikTok's interface, its evolution as a short-video platform, and how it can be used as an educational resource in mathematics learning.

2.1. Short videos and TikTok as an educational resource

The evolution of short videos over the years reflects a dynamic and innovative journey in how we consume and share visual content. From the YouTube revolution in 2005, followed by Vine in 2013, to the emergence and popularization of TikTok in 2016, we have witnessed the transformation of how stories are told and ideas are conveyed in a concise and captivating way.

These platforms have not only opened up new creative possibilities but have triggered a significant cultural shift, permeating music, fashion, and many aspects of contemporary society. With additions like the Reels on Instagram in 2019 and the Shorts on YouTube in 2021, it is clear that short-form videos continue to shape the way we communicate and express ourselves in an increasingly digital and interconnected world (Figure 1).

Figure 1: Instagram Reels, TikTok short videos, and Youtube Shorts

Source: Research data (2023)

Instagram Reels, YouTube Shorts, and TikTok allow the creation and sharing of short videos, each with its specific emphasis: Reels is more visual, Shorts focuses on educational and informative content, and TikTok stands out for its creativity and entertainment. All offer editing features and are popular, but TikTok, founded in 2016 by ByteDance,[3] stands out for its recommendation algorithm, focus on user creativity, and active community.

We chose this social media due to its growing popularity and remarkable influence among students. With over 1 billion users, it is powerful in connecting and engaging the school community (TikTok, 2024, np).

The choice of TikTok is based on the fact that, during the COVID-19 pandemic, the app was the most downloaded worldwide and was widely used to create and disseminate educational content (TikTok, 2024, n.). This context highlights TikTok's potential as an educational resource, especially in capturing the attention of a young, digitally active audience.

The role of the media is fundamental in integrating new attitudes into everyday life in a pleasurable way. Bringing technology closer to the classroom is relevant because it can facilitate learning (Brasil, 2023). Therefore, we used TikTok as an educational resource for teaching and learning fractions.

Monteiro (2020) states that it is essential for educators to use media as facilitators in teaching, as children are used to technology. Borba, Souto, and Canedo Júnior (2022) highlight that social networks, an integral part of everyday life and technological advances, impact society and the educational system, acting as tools to improve the quality of learning.

The accessible and attractive interface of the app allows it to be used by any age group, offering a wide variety of content, such as education, sports, leisure, politics, and humor. When creating an account, the user can select the content of interest. Below, we will present authors who explore using TikTok in education and its potential as an educational resource in the classroom.

Barin, Ellensohn, and Silva (2020) and Tavares *et al.* (2022) agree that, although social networks are considered a possible alternative for teaching and learning processes, little research ex-

3 ByteDance is a Chinese company for the development and use of inteligência artificial (I.A.) https://epocanegocios.globo.com/palavrachave/inteligencia-artificial/ Available at: : <https://epocanegocios.globo.com/empresa/noticia/2019/08/conheca-chinesa-bytedance-startup-mais-valiosa-do-mundo.html>. Accessed on: May 30 2023.

plores using TikTok in this context. Documented experiences on TikTok as an educational resource are scarce, even with its popularity during the pandemic as a pastime during social isolation.

Teachers now face a different audience, compared to the evolution of technology, especially after the pandemic: the connected generation (Monteiro, 2020). In this context, it is up to the teacher to take responsibility for guiding students on how to use these resources appropriately (Brasil, 2023).

Santos and Carvalho (2020) and Monteiro (2020) point out that TikTok can contribute to the teaching and learning curriculum content. However, teachers who use or intend to use this media need to rethink their practices to adapt to the technological language and the time limit imposed by the platform.

Adapting curriculum content to TikTok brings learning closer to students' reality. Santos and Carvalho (2020) and Monteiro (2020) highlight that to take advantage of the digital resources of the app effectively, students must research, carefully select, and critically reflect on the available content, identifying those that actually contribute to their learning.

In the theoretical conception of Brandão, Brandão, and Souza (2022) and Barin, Ellensohn, and Silva (2020), the use of short videos in teaching and learning using the TikTok app shows that it is not only used for entertainment but also as a resource for knowledge formation. We observe that short videos are becoming popular because:

> The trend of consuming increasingly shorter videos may, to some extent, result from the fast-paced nature of modern life. Social media users have explained that their preference for social media platforms with short videos is due to convenience (Wang, 2020, p. 106373).

Wang (2020) notes that the preference for short videos on social media is linked to the speed and efficiency of obtaining information. Short videos require less attention span, aligning with the fast pace of modern life, allowing consumers to absorb content quickly and adapt to a dynamic lifestyle —where time is valuable.

Da Rocha and De Farias (2020) state that short videos —called "learning pills"— are effective because they are intense and objective, and accessible via mobile devices. These videos help reduce mental load and maintain students' attention, making the content more accessible and controlling information overload that can cause attention deficit.

Therefore, creating short videos on TikTok can be a practical option for sharing educational information. One of the difficulties in this creation process is in preparing the script since the time available to present the content is quite limited, generally ranging from just a few seconds to a maximum of ten minutes. Likewise, Brandão, Brandão, and Souza (2022, p. 9) emphasize that:

> [...] TikTok's configurations regarding communication, information, and knowledge processes, when added to the profile of the consumer audience of this media, demonstrate that in its appropriation, there is potential for pedagogical use, as in other social media, presenting possible contributions to teaching and learning processes.

On TikTok, teachers see an opportunity to create and share educational content, potentially stimulating student curiosity and engagement, which, in turn, can increase interest in knowledge construction and give meaning to the learning process.

Monteiro (2020), Barin, Ellensohn, and Silva (2020), and Santos and Carvalho (2020) highlight that encouraging students to create videos on TikTok promotes active participation in the learning process. Although they may seem simple, these activities challenge students to dedicate themselves to creating videos, valuing their contribution to knowledge development.

We conducted a literature review to explore different perspectives on TikTok as an educational tool for understanding mathematical concepts, focusing on the period from 2020 to 2023, during which the application was the most downloaded worldwide, especially during the pandemic. We used the terms TikTok *and* teaching *and* learning *and* mathematics as search descriptors, applying the BUSCAd spreadsheet[4] (Mansur; Altoé, 2021).

We identified forty-two studies, predominantly international articles. As exclusion criteria, we discarded research that was not aligned with our methodology, did not belong to the period analyzed, or addressed other disciplines. We selected five relevant studies: Soriano's articles *et al*. (2021), Borba and Xavier (2022), Vázquez (2023), and the dissertations by Zofío (2021) and Souza (2022).

Souza (2022) highlights TikTok's potential to transform students into active participants, converting traditional classrooms into collaborative, creative, and autonomous learning environments.

Borba and Xavier (2022) and Vázquez (2023) agree that short videos can be promising tools for distributing mathematical concepts. They emphasize the importance of using these digital technologies to enrich learning and help students develop critical skills in mathematics, reinforcing logical reasoning and reducing resistance to the subject.

Therefore, we conclude that TikTok, due to its accessible language for students, can be an effective strategy for teaching mathematics. Besides producing videos on the platform, students interact with this content to complement their learning through viewing and sharing (Borba; Xavier, 2022).

TikTok has proven to be a promising educational tool, accessible to many students, and increasingly used by teachers to support school activities and distribute content (Monteiro, 2020). Thus, we use TikTok for mathematics teaching and learning, focusing on fractions for the 6th grade of elementary school.

4 This technological tool, developed in Microsoft Excel, can contribute to the process of importing and processing study data to carry out a literature review and assist teachers in researching pedagogical practices for specific content or teaching methodologies. It was developed based on the needs of master's and doctoral students of the Postgraduate Program in Science and Mathematics Education (Educimat), of the Federal Institute of Espírito Santo (Ifes), in carrying out literature reviews of their research. Available at: https://linktr.ee/buscad.

3. Methodology

The methodology adopted in this study was qualitative, as defined by Araújo and Borba (2023, p. 25), who state that "research that uses qualitative approaches provides us with more descriptive information, which focuses on the meaning given to actions." The study followed an exploratory approach, aiming to investigate the pedagogical potential of video production by students on TikTok for learning the concept of fractions in the 6th grade of elementary school. According to Gil (2022, p. 41), exploratory research aims to "provide greater familiarity with the problem, to make it more explicit or constituting hypotheses."

The research was carried out at a municipal school in São Mateus–ES, after authorization from the Ethics Committee (CEUNES/UFES, Opinion: 6,282,577/05 September 2023), involving two 6th-grade classes of approximately 25 students. The research took place between October 2023 and February 2024, and it was developed during 10 50-minute classes in partnership with the responsible teacher. The classes were identified as Fracionando1 and Fracionando2, and the students as A1 to A25 and B1 to B24, respectively.

Students can use mobiles at this school as long as their guardians authorize them for educational purposes. At the beginning of the research, those responsible authorized and responded to a formal interview about the application. When starting the project, we introduced the idea of TikTok as an educational tool.

During this stage, the objectives of the activity and expectations related to the production of the videos were explained. Students were informed about how TikTok could be used to illustrate and reinforce the concept of fractions and understood how their videos could serve as learning material.

Students were divided into pairs to create the videos. Each pair received detailed guidance on creating concept maps to help organize ideas and review the content needed to make the videos. Furthermore, developing scripts for the videos was explained, ensuring that the content was addressed in a clear and structured manner (Figure 2).

Figure 2: Students from Fracionando1 and Fracionando2 working at their desks during video production, producing the conceptual maps and the recording script

Source: Research data (2023)

In the video production phase, each pair chose a specific theme related to fractions, which included topics such as the representation of fractions, fractions of a quantity, comparison of

fractions, equivalent fractions, simplification of fractions, and operations with fractions. They used slides in PowerPoint as a basis for the content of the videos, enriching them with narratives and audio recordings made with TikTok's native recorder (Figure 3).

Figure 3: Students from Fracionando1 and 2 during the production process, using PowerPoint slides and narratives recorded on TikTok

Source: Research data (2023)

The videos were then edited directly in the TikTok app and posted to the accounts created for the project, https://www.tiktok.com/@fraccionando1 and https://www.tiktok.com/@fraccionando2 (Figure 4).

Figure 4: Fracionando1 and Fracionando2 profiles on TikTok

Source: Research data (2023)

After video production, we held classroom feedback sessions to discuss video content and presentation, guiding improvements and adjustments. The videos were used as support material in classes, and students' interaction with the videos was monitored and evaluated through questionnaires and continuous observations.

We tracked video views and interactions on the TikTok platform between 11/10/2023 and 02/29/2024, focusing on the number of views, minutes watched, and shares. The effectiveness of videos as a complementary learning tool was assessed through questionnaires, interviews, observations, and learning verification activities. The analysis included students' interaction with the videos and the impact on their understanding of fractions.

We use data triangulation to compare information from different sources: video production, interviews, and observations. The interviews were carried out at the beginning of the research to verify perceptions about the application and at the end of the production of the videos to analyze learning and observations through monitoring each stage.

Triangulation, according to Goldenberg (2020), provides a maximum description of the object of study. We applied the principles of the cognitive theory of multimedia learning (CTML) (Mayer, 2019) to analyze the effectiveness of videos, considering the combination of words and images in facilitating knowledge.

After analyzing the videos, we applied a learning verification activity consisting of nine questions about the content covered. Student interaction with the videos was assessed through the TikTok Analytics tool (TikTok, 2024, n.p.). Below, we present a summary of the results obtained in the research.

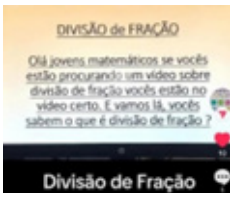
4. Results and discussions

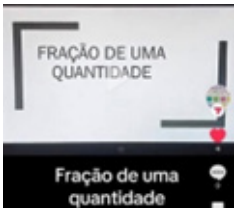
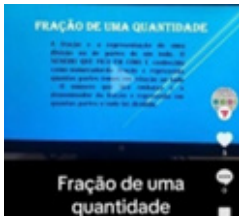
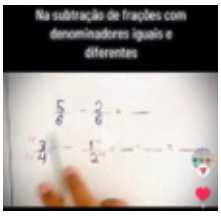
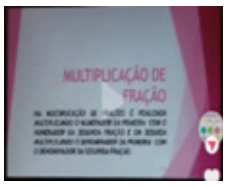
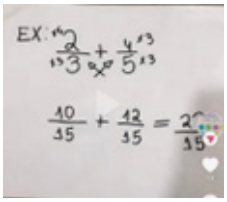
The research employed data triangulation, combining video analysis through CTML with interviews, observations, and practical activities to assess student learning of fractions. Using Goldenberg-based triangulation (2020) with CTML principles, the videos produced by the students were analyzed to determine their understanding of fractions.

The videos were identified as V1 to V11 in Fracionando1 and V1 to V13 in Fracionando2. They were analyzed based on the 12 CTML principles, allowing us to evaluate the effectiveness of the videos in transmitting the concept of fractions and identify areas for improvement.

In Table 1, we list the videos produced by Fracionando1, the content covered and the links to access TikTok.

Table 1: Videos produced by Fracionando1

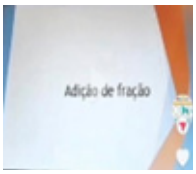
VIDEO	IMAGING	CONCEPT OF FRACTIONS	LINK
V1		Simplifying fractions	https://www.tiktok.com/@fracionando1/video/7302461579386277125?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V2		Division of fractions	https://www.tiktok.com/@fracionando1/video/7302461557726907653?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V3		Addition of fractions	https://www.tiktok.com/@fracionando1/video/7302460852819479813?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901

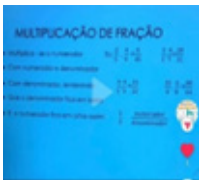
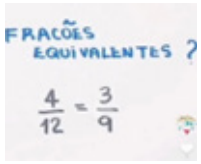
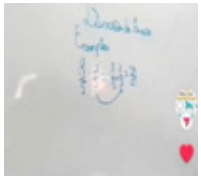
V4		Fraction of a quantity	https://www.tiktok.com/@fracionando1/video/7302088948396952837?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V5		Fraction of a quantity	https://www.tiktok.com/@fracionando1/video/7302088254780706053?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V6		Addition of fractions	https://www.tiktok.com/@fracionando1/video/7301976870327831813?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V7		Division of fractions	https://www.tiktok.com/@fracionando1/video/7301818641069116678?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V8		Representation of fractions	https://www.tiktok.com/@fracionando1/video/7299488905185856773?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V9		Subtraction of fractions	https://www.tiktok.com/@fracionando1/video/7299488439555181830?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V10		Multiplication of fractions	https://www.tiktok.com/@fracionando1/video/7299488352586321157?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V11		Addition of fractions	https://www.tiktok.com/@fracionando1/video/7292205424672148741?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901

Source: Research data (2023)

In Chart 2, we listed the videos produced by Fracionando2, the content covered, and the links to access TikTok.

Chart 2: Videos produced by Fracionando2

VIDEO	IMAGING	CONCEPT OF FRACTIONS	LINK
V1		Addition of fractions	https://www.tiktok.com/@fracionando2/video/7303733168484551942?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V2		Addition of fractions	https://www.tiktok.com/@fracionando2/video/7303514644268829958?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V3		Subtraction of fractions	https://www.tiktok.com/@fracionando2/video/7303506288967879942?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V4		Representation of fractions	https://www.tiktok.com/@fracionando2/video/7303505649734929670?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V5		Equivalent fractions	https://www.tiktok.com/@fracionando2/video/7302090711950888198?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V6		Comparing fractions	https://www.tiktok.com/@fracionando2/video/7299576230334958854?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V7		Fraction of a quantity	https://www.tiktok.com/@fracionando2/video/7299486998035827973?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V8		Multiplication of fractions	https://www.tiktok.com/@fracionando2/video/7299487007753997573?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901

V9		Division of fractions	https://www.tiktok.com/@fracionando2/video/7299486883967536390?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V10		Multiplication of fractions	https://www.tiktok.com/@fracionando2/video/7299085292072439046?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V11		Equivalent fractions	https://www.tiktok.com/@fracionando2/video/7294673331654102278?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V12		Division of fractions	https://www.tiktok.com/@fracionando2/video/7294211058883939590?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901
V13		Simplifying fractions	https://www.tiktok.com/@fracionando2/video/7292368139046767878?is_from_webapp=1&sender_device=pc&web_id=7309153870344848901

Source: Research data (2023)

The research began in the second half of October 2023 and ended in the last week of February 2024. The process included a detailed review of videos generated by students in both classes. Several aspects were observed, such as the duration of the videos, the use of language (formal or informal), the presence of background music, and the presentation format of mathematical concepts (Borba; Xavier, 2022).

The analysis revealed that most videos opted for a formal approach without background music, lasting less than three minutes, in line with the preference for simple and short presentations to facilitate understanding of mathematical concepts (Braga, 2024).

The research used TikTok *Analytics* to evaluate engagement metrics such as views and shares, allowing us to measure the effectiveness of videos in terms of reach and impact (TikTok, 2024, np). This analysis helped to understand how TikTok's format and engagement features influenced students' learning in understanding the concept and also provided app users who accessed the content with knowledge of mathematical knowledge in an uncomplicated and practical way.

After viewing the videos, each was subjected to multimedia analysis based on the principles of the CTML, and the content exposure and learning survey were classified as unsatisfactory, satisfactory, or ideal, according to the number of principles met (Chart 3).

Chart 3: Categories of analysis according to CTML principles

CATEGORY	PERCENTAGE	PRINCIPLES MET
Unsatisfactory	0% - 40%	0 to 5
Satisfactory	41% - 79%	5 to 9
Ideal	80% - 100%	10 to 12

Source: Research data (2023)

Fracionando1 produced 11 videos (V1 to V11) and Fracionando2 created 13 videos (V1 to V13). The video results were analyzed according to CTML principles to highlight satisfactory areas of learning, as detailed in Chart 4.

Chart 4: Summary of the analysis of the videos by Fracionando1

Video	Fraction concept addressed	Coherence	Signaling	Redundancy	Spatial contiguity	Temporal contiguity	Segmentation	Pre- training	Modality	Multimedia	Customization	Voice	Image
V1	Simplifying fractions	x			x	x		x		x	x	x	x
V2	Fraction division	x			x	x			x	x	x	x	x
V3	Fraction addition	x			x	x	x	x	x	x		x	x
V4	Fraction of a quantity											x	x
V5	Fraction of a quantity	x	x	x				x				x	x
V6	Addition of fractions	x	x				x	x				x	x
V7	Division of fractions	x	x	x	x	x		x	x	x		x	x
V8	Fraction representation	x	x	x	x							x	x
V9	Fraction subtraction	x	x	x	x	x	x	x	x	x			x
V10	Fraction multiplication											x	x
V11	Fraction addition	x	x	x			x	x	x	x		x	x

Source: Research data (2023)

Videos V4 and V10 were identified as the least satisfactory, with deviations in ten of the twelve principles analyzed, while videos V7 and V9 were considered closer to the ideal, with only two deviations (Mayer, 2019). Below, we present the analysis of the videos produced by the Fracionando2 class (Chart 5).

Chart 5: Summary of the analysis of the videos from the Fracionando2 class

Video	Fraction concept addressed	Coherence	Signaling	Redundancy	Spatial contiguity	Temporal contiguity	Segmentation	Pre- training	Modality	Multimedia	Customization	Voice	Image
V1	Fraction addition		x		x	x	x					x	x
V2	Addition of fractions	x	x	x	x	x	x		x	x		x	x
V3	Subtraction of fractions	x	x	x	x							x	x
V4	Fraction representation	x	x		x		x					x	x
V5	Equivalent fractions						x					x	x
V6	Comparing fractions	x	x	x			x					x	x
V7	Fraction of a quantity		x	x	x		x	x	x	x		x	x
V8	Fraction multiplication		x	x	x		x	x	x	x		x	x
V9	Fraction division		x	x	x		x	x	x	x		x	x
V10	Fraction multiplication	x	x				x				x	x	x
V11	Equivalent fractions		x	x	x			x	x	x		x	x
V12	Fraction division	x		x	x	x		x	x	x			x
V13	Simplifying fractions		x		x	x		x	x	x	x		x

Source: Research data (2023)

The analysis of the videos produced by Fracionando1 and Fracionando2 was completed based on data triangulation and CTML principles. Video V5 was identified as the least satisfactory, presenting deviations in nine of the twelve analyzed principles. In contrast, video V2 stood out as

the closest to the ideal, with only two deviations and a more effective contribution to learning the concept of fractions (Mayer, 2019).

During the analysis, we observed that Fracionando1 had a remarkable performance in the production of videos, standing out for the creativity and technical quality of the productions, which included good voice quality and efficient images. Composed of students with age/grade gaps, Fracionando2 demonstrated less creativity, influenced by shyness and disinterest.

The videos were less than three minutes long, in line with the premise that simple and brief presentations are more suitable for mathematical content (Borba; Xavier, 2022). The preference for short videos reflects their effectiveness in distributing knowledge, facilitating understanding in a less tiring way (Da Rocha; DeFarias, 2020; Wang, 2020).

Observations made during the production of the videos showed a collaborative dynamic, with students dedicated to exploring visual and narrative strategies to explain fractions, confirming what Borba and Xavier (2022) pointed out in their research. These data highlight the influence of students' previous experiences with different types of videos on their choices and approaches in creating educational videos, as Braga (2024) admitted.

Individual and formal interviews conducted after the production process provided students with direct insights about the learning process with the videos, revealing their challenges, discoveries, and feelings regarding using TikTok as an educational tool.

The initial (students and guardians) and final (students only) analyses of the questionnaires indicated that 69% of the 6th-grade students have access to TikTok, with 63% of guardians confirming use. Although 42% of students use the application to search for mathematics content, only 21% of those responsible monitor the content accessed. These data show the potential of TikTok as an educational tool (Monteiro, 2020) but highlight the need for greater supervision and guidance in using the platform for academic purposes (Brasil, 2023).

The analysis of the evaluation questionnaires revealed that the production and use of videos were effective in helping students understand and apply the concept of fractions. As student A8 said: "*The videos helped us remember and understand fractions and facilitated the practical application of concepts*." Suggestions to explore different video styles and include everyday examples (Braga, 2024) reinforce the idea that videos are valuable for promoting understanding and engagement in mathematical learning.

The learning verification activity demonstrated an overall positive performance in representing and understanding fractions. Although most students answered the initial questions about fundamental concepts correctly, they faced more difficulties in the final questions that required operations with fractions and problem solving (Moreira, 2020).

The results evidenced the effectiveness of the pedagogical strategies adopted, including the use of short videos as a learning tool. However, it is important to highlight the need for continuous assessment, considering factors such as the clarity of instructions and student engagement (Santos; Carvalho, 2020).

The interpretation of the data considering different sources and methods (Araújo; Borba, 2023) helped us understand the impacts of video production on 6th-grade elementary school students's learning of fractions. However, it is essential to note that although adherence to CTML principles is important, it does not guarantee the effective achievement of learning due to the various variables involved, such as the quality of the videos, the particularities and individual needs of students, and the time dedicated to learning.

Therefore, the results indicate that using TikTok can be an engaging auxiliary resource to minimize difficulties in contextualizing and applying the concept of fractions, promoting more interactive and interesting learning.

5. Final Considerations

Using TikTok to learn fractions challenged the 6th-grade elementary school students. These difficulties are rooted in negative past experiences and the traditional teaching approach, which often lacks contextualization and connection to everyday situations.

The proposal to integrate TikTok as an engaging approach has shown promise. The possibility for students to create short videos to illustrate their understanding promoted more contextualized learning relevant to their realities. The results confirm that TikTok can be an efficient resource to promote a more dynamic and participatory approach to learning the concept of fractions for 6th-grade students.

The analysis, which considered several sources and methods and the CTML principles enabled an understanding of the potential impacts of video production on TikTok to clarify the concept of fractions. However, it is essential to highlight that, although the CTML principles are met, this alone does not guarantee the effective achievement of learning, as other variables influence the process that must also be considered: students' individualities and the time made available for learning.

The results suggest that TikTok can be an efficient auxiliary resource for overcoming difficulties in contextualizing and applying fractions, promoting more interactive learning.

For future research, we recommend investigating the long-term effectiveness of TikTok in understanding different mathematical concepts, as well as analyzing teachers' perceptions about using this tool in educational support and mathematics teaching practice.

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