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The Brazilian Mathematics Educator Ubiratan D'Ambrosio in vídeos: Ethnomathematics and the unveiling of Mathematics

O Educador Matemático Brasileiro Ubiratan D'Ambrosio em vídeos: a Etnomatemática e o desvelamento da Matemática

El Educador Brasileño en Matemáticas Ubiratan D'Ambrosio en videos: Etnomatemáticas y el develamiento de las Matemáticas

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Abstract: The aim of this article, of a qualitative approach and descriptive-exploratory nature, was to analyze the contribution of audiovisual material made available on the YouTube platform with the participation of Ubiratan D'Ambrosio on Ethnomathematics. The procedure was a survey and selection of audiovisual material on YouTube with a speech by D'Ambrosio that included the subject of Ethnomathematics and with more than 5,000 views. Six videos, which were made available between 2013 and 2020, were selected. They have a duration varying between five minutes and two hours. The audiovisual material available contains conceptualization and discussion of Ethnomathematics, in addition to the possibility of access and comprehension in a distinctive manner utilizing digital media. According to the theorist, and based on the video analysis, Ethnomathematics is a cultural construction carried out by different groups in their daily lives in the search for survival and transcendence. The importance of digital media as a means of access to information and democratization of knowledge is also emphasized.

Keywords: Mathematics Education. Ethnomathematics. Digital media (YouTube).

Resumo: O objetivo deste artigo, de abordagem qualitativa e caráter descritivo-exploratório, foi analisar a contribuição do material audiovisual disponibilizado na plataforma *YouTube* com a participação de Ubiratan D'Ambrosio abordando a Etnomatemática. O procedimento foi levantamento e seleção de material audiovisual no *Youtube* com a fala de D'Ambrosio, que incluísse o assunto Etnomatemática e com visualização acima de 5.000. Foram selecionados seis vídeos disponibilizados entre os anos de 2013 e 2020, com tempo de duração variando entre cinco minutos e duas horas. O material audiovisual disponibilizado contém conceituação e discussão sobre a Etnomatemática, além de possibilidade de acesso e entendimento de forma diferenciada por meio da mídia digital. A Etnomatemática é, para o teórico, segundo análise dos vídeos, uma construção cultural realizada por grupos distintos em suas vivências cotidianas na busca da sobrevivência e transcendência. Destaca-se também a importância das mídias digitais como modo de acesso à informação e democratização do conhecimento.

Palavras-chave: Educação Matemática. Etnomatemática. Mídias digitais (*YouTube*).

Resumen: El objetivo de este artículo, de enfoque cualitativo y de carácter descriptivo-exploratorio, fue analizar la contribución del material audiovisual puesto a disposición en la plataforma YouTube con la participación de Ubiratan D'Ambrosio sobre Etnomatemáticas. El procedimiento fue una encuesta y selección de material audiovisual en YouTube con una ponencia de D'Ambrosio que incluía el tema de Etnomatemáticas y con más de 5.000 visualizaciones. Se seleccionaron seis videos que estuvieron disponibles entre 2013 y 2020. Tienen una duración que varía entre cinco minutos y dos horas. El material audiovisual disponible contiene conceptualización y discusión de las Etnomatemáticas, además de la posibilidad de acceso y comprensión de forma diferenciada utilizando medios digitales. Según el teórico, y con base en el análisis del video, la Etnomatemática es una construcción cultural que realizan diferentes grupos en su vida cotidiana en la búsqueda de la supervivencia y la trascendencia. También se destaca la importancia de los medios digitales como medio de acceso a la información y democratización del conocimiento.

Palabras clave: Educación Matemática. Etnomatemáticas. Medios digitales (*Youtube*).

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INTRODUCTION[1]

Talking about mathematics means thinking about life and understanding social reality with its culture, humanity, diversity, democracy, and everyday problems. It is also to think about the school subject, as this field of knowledge is part of the development of the history of humankind and formal education.

Talking about Ubiratan D'Ambrosio means thinking about humanity, social justice, dignity, the emergence of the new man, Mathematics in the plural, cultures, respect, cooperation, diversity, and struggle as his life trajectory is marked by these questions. For the mathematical theorist, thinking about education for all only makes sense if it "[...] enables a better quality of life and greater dignity for humanity as a whole" (D'Ambrosio, 2005, p. 105). Such dignity manifests itself in the relationships that each individual establishes with another. He died in May 2021 at the age of 88, but his legacy transcends his existence and is perpetuated in the field of mathematics.

Ubiratan D'Ambrosio was born in 1932 in São Paulo, the grandson of Italian and Spanish immigrants, son of Nicolau D'Ambrosio (mathematics teacher) and Albertina Graciotti.

High School and the Mathematics course at the University of São Paulo were highlighted by him as fundamental in his life. In an interview, he speaks enthusiastically about his teachers and how his experience with them, during his student life, was a source of inspiration for his work as a teacher. In 1963 he defended his Doctoral Dissertation under the title Generalized Surfaces and Finite Perimeter Sets (Borges, Silva, & Campos, 2014).

The mathematics educator was influenced by the diversity of experiences in Brazil and other countries, by the teaching experience, and by the search for new teaching methods. Besides an expanded vision of the world and of how the plural applies to human life, he perceived the existence of Mathematics inserted in everyday life. For

[1] This article originated from the text presented at the XIV Encontro Nacional de Educação Matemática (ENEM) [National Meeting on Mathematics Education], held in July 2022 (Brazil).

this reason, he defended the need for modern Mathematics that considers cultures, knowledge, social.

From this perspective, D'Ambrosio believes that mathematics is part of everyday life, so it should not be worked on stereotypically nor detached from reality. Conversely, one must consider the mathematical knowledge that the child acquires before schooling since man is an integral being, "[...] an integrated individual, immersed in a natural and social reality, which means in permanent interaction with his environment, naturally and socially" (D'Ambrosio, 1996, p. 19), and that the social context is alive and in constant movement. Mathematics Education is one of the subfields of this area of knowledge. The trends in this subarea are History in Mathematics Teaching, Mathematical Modeling, Problem Solving, Reading and Writing in Mathematics, Critical Mathematics Education, and Ethnomathematics, the latter being the focus of this study.

D'Ambrosio was a precursor to many discussions in the field of Mathematics Education, among which are Humanized Mathematics, Transdisciplinarity, and Ethnomathematics. This emerged in the mid-1970s as a response to criticism of traditional mathematics education and the need to analyze mathematical practices in different cultural contexts. According to D'Ambrosio (2018, p. 192),

> [...] using these Greek roots, the ways, styles, arts and techniques [tics] for doing and knowing, explaining, understanding, teaching and learning [mathema] in the natural, sociocultural and imaginary environment [ethno], can be synthesized into a compound word: 'tics' from 'mathema' into distinct ethnos or ics+mathema+ethno or, reorganizing the sentence, ethno+mathema+tics or simply Ethnomathematics.

In this way, Ethnomathematics focuses on the understanding of human (and mathematical) knowing and doing, and its relations to mathematics throughout history. For D'Ambrosio (2019, p. 23), the central role of ethnomathematical (or mathematical) ideas "[...] in all civilizations is that they provide the intellectual tools for dealing with and defining strategies for action in novel situations." It has as a reference the fact that

each culture has its own mathematical manifestations with its own categories and "[...] recognizing that it is proper to the human species the satisfaction of survival and transcendence impulses, absolutely integrated, as in a symbiotic relationship" (D'Ambrosio, 2001, p. 44-45). The methodology is marked by the ability to "observe and analyze the practices of differentiated communities and populations"(D'Ambrosio, 2008, p. 8). The human species has the drive for survival and transcendence integrated through symbolic relationships and therefore creates ways of understanding and acting in the world (Urton, 1997).

In 1987 D'Ambrosio conceptualizes Ethnomathematics and later explains that: "[...] his conceptualization of ethno+mathema+tics recognizes culture-specific cognitive strategies for dealing with reality and appropriate categories for constructing knowledge of that culture" (D'Ambrosio, 2018, p. 192). His main methodology is "[...] the ability to observe and analyze the practices of differentiated communities and populations" (D'Ambrosio, 2008, p. 8), as well as anything that is part of everyday life constitutes means of research, such as literature, journal and diary reading, games, cinema, social media, and the video-sharing platform YouTube (D'Ambrosio, 2008).

In 2005, the mathematics educator states that in the educational dimension, Ethnomathematics favors qualitative reasoning, its focus is related to the environmental or production nature, and it is rarely disconnected from other cultural manifestations (D'Ambrosio, 2005). Therefore, Ubiratan D'Ambrosio defends the Ethnomathematics Program as a branch of Mathematics Education, as it enables this field of knowledge to be the discipline of diversity and elimination of discriminatory inequality through Humanistic Mathematics. Giving us "[...] the hope of reaching the new man, for which the choice between the oppressor or the oppressed loses meaning" (D'Ambrosio, 2019, p. 24).

Ubiratan D'Ambrosio was and still is one of the greatest exponents of Ethnomathematics, dedicating part of his production to thinking about how the cultural aspect organizes the development of mathematics. Therefore, stating that the Western way of conceiving mathematics is not the only one, nor the best one, is configured as

one more way of creating this knowledge, thus breaking with the Eurocentric paradigm of mathematics.

Given the magnificent work of this Mathematics Education theorist, author of far-reaching books, articles, and texts in proceedings on Ethnomathematics, it is deemed relevant to analyze the contribution of the audiovisual material made available on Youtube. This material includes the participation of the mathematician Ubiratan D'Ambrosio, and approaches on Ethnomathematics. Such material for analysis and reflection is understood as a means of disseminating and understanding, through the speeches of this educator, that "[...] different cultures have different ways of dealing with everyday situations and problems and different manners of giving explanations about natural and social facts and phenomena" (D'Ambrosio, 2018, p. 189). Further, it is a means of perceiving how these different ways also manifest themselves in Mathematics. An audiovisual production that allows both spectator and researcher to weave dialogues with the mathematics educator from the perspective of Ethnomathematics in the scene. Thus, broadening the understanding of specific issues of this subfield (Fraz & Moreira, 2022).

Methodologically, this is a qualitative approach study because it is concerned with aspects of reality that cannot be quantified, along with considering understanding the dynamics of social relations. The objectives are descriptive and exploratory since they seek to describe the characteristics of a phenomenon and deepen the understanding of the fact. The theoretical background was constituted by D'Ambrosio (2001; 2005; 2008; 2018; 2019), Kerber, Bez and Passerino (2014), and Sorj (2003).

Ubiratan D'Ambrosio has left his mark on Mathematics Education in Brazil. He also disseminated the knowledge produced in Brazil to the world, influencing the teaching and learning of Mathematics. He is one of the few researchers from non-European countries who had repercussions in international Mathematics Education.

One of the means of spreading his work is the availability of classes/courses, lectures, interviews, and dialogues with other theorists through digital media, which became popular due to the improvement of the Internet. According to Sorj (2003, p.

37), “[...] by placing much of human knowledge in virtual space, facilitating the exchange and expression of ideas in real-time,” it also allowed “[...] breaking one of the barriers that limited and surrounded the access and transmission of information”.

According to Kerber, Bez and Passerino (2014, p. 251), "the forms of interaction and communication offered by digital media allow unexpected associations and enable large-scale information exchanges". Thus, YouTube and all online video portals subsequent to it have transformed the way of absorbing content, as stated by Burgess and Green (2009), and opened unprecedented channels for information and knowledge.

MATERIALS AND METHODS

This research analyzed the contribution of audiovisual material made available on the YouTube platform and featuring the mathematics educator Ubiratan D'Ambrosio addressing Ethnomathematics. The use of the platform is feasible because "[...] any cultural artifact can be a source of data or a basis for analysis, provided that it receives the necessary scientific treatment, and that appropriate mediation occurs" (Fraz, 2004, p. 134).

The YouTube search on Ubiratan D'Ambrosio revealed a significant number of videos in which the mathematics educator presents his ideas on Ethnomathematics and other subjects relevant to Mathematics Education. From this point on, the methodological procedure was the survey, the selection of audiovisual material and followed the steps: i) definition of the research string or descriptor, Ubiratan D'Ambrosio; ii) search on the YouTube platform; iii) use of YouTube's filters to select the videos to be analyzed considering firstly the number of views (from 5,000 views); iv) the second inclusion criterion was the video bringing Ubiratan D'Ambrosio discussing Ethnomathematics. The data was collected in March 2022.

Without a specific timeframe, the selected videos, which carried the theme of the proposed study, are from 2013 (1), 2014 (1), 2015 (1), and 2020 (3). In the table below, they were organized by the decreasing date of availability:

Chart 1: Videos selected for the analysis

Link	Views	Available on	Duration
Como surgiu a Etnomatemática - Ubiratan D´Ambrosio [How Ethnomathematics Came About – Ubiratan D´Ambrosio] https://www.youtube.com/watch?v=9SNbt5KFq9o	58.752	20/10/2020	5min 17s
Ubiratan D'Ambrosio – Etnomatemática [Ubiratan D'Ambrosio – Ethnomathematics] https://www.youtube.com/watch?v=kUCNDK7DeKs	18.834	01/06/2020	12min 10s
Etnomatemática e Matemática Humanista: uma conversa com Ubiratan D´Ambrosio [Ethnomathematics and Humanistic Mathematics: a conversation with Ubiratan D'Ambrosio] https://www.youtube.com/watch?v=YYXoBpZy6Fo	8.838	09/04/2020	42min 03s
Curso EAE – Prof. Dr. Ubiratan D'Ambrosio – Aula 1 – Natureza da Matemática [AEA Course – Nature of Mathematics – Professor Ubiratan D'Ambrosio] https://www.youtube.com/watch?v=UI1Kjf54ey0	19.185	31/07/ 2015	2h 30min 31s
Educação Brasileira 179 – Ubiratan D'Ambrosio e Nilson José Machado [Brazilian Education 179 – Ubiratan D'Ambrosio and Nilson José Machado] https://www.youtube.com/watch?v=-vRBZYw_wfw	20.546	01/10/2014	29min 38s
Vida de Cientista – Ubiratan D'Ambrósio – PGM 07 [Life of a Scientist – PGM 07] https://www.youtube.com/watch?v=A4WRwftHXeo&t=5s	70.057	30/08/2013	51min 55s

Source: Elaborated and translated by the authors (2022).

We did not limit ourselves to just watching and listening but analyzing the videos in their constitution on the YouTube video platform, whose choice was due to its reach, accessibility, and free of charge. This platform was created in 2005 by Chad Hurley, Steve Chen, and Jawed Karim, in the United States (Burgess & Green, 2009), and

brings together diverse content and is increasingly used by academia. According to Oliveira (2017, p. 5), electing YouTube as a research source "[...] breaks with paradigms concerning the methods of dissemination and incorporation of knowledge." The individual who produces is already the message and makes the internet user receive the knowledge transmitted without the need for formal reading, which is not always understood by everyone.

The YouTube platform enables the user to access a multitude of videos and content, allowing the production, dissemination, and sharing of multiple possibilities that contribute to students, professionals, and others interested in the production of authors/theorists such as Ubiratan D'Ambrosio.

RESULTS AND DISCUSSIONS

The six selected videos were made available on YouTube between 2013 and 2020, but we note that some of them were made before the date of inclusion on the platform. The number of views exceeds 200.000, so it is possible to infer that digital media have the potential to democratize access to information and human knowledge in virtual space (Sorj, 2003)

Among the videos selected, three were made available by colleges/universities and three by channels whose objective is the dissemination and discussion of educational issues. Thus, the videos may be another source of teacher training on Ethnomathematics and may contribute to a teaching practice that considers activities and actions taking place in the social practice of mathematics in the different groups to which we belong (Vieira & Moreira, 2020).

Another factor of analysis was the length of the videos, which varied between five minutes and two hours, but this variation is not directly related to the number of views. The theme Ethnomathematics appeared in all the videos, in some as the main point, in others in the middle of various themes, such as Humanized Mathematics, Mathematics Education and Transdisciplinarity.

In the video *Ethnomathematics and Humanistic Mathematics: a conversation with Ubiratan D'Ambrosio* the focus is on the humanistic character of mathematics. When talking about his career, the mathematics educator tells us that teaching in Africa increased his knowledge of the world and gave him the desire to investigate other ways of doing mathematics. He strongly affirms that Ethnomathematics is often wrongly interpreted as ethnicity, but it has nothing to do with that. For him, Ethnomathematics is when a group with cultural affinity organizes thinking and to this end classifies, arranges, and draws conclusions, and uses the components of mathematics. These are techniques of *mathema* done by groups in a specific way. He cites as an example the Ethnomathematics of the topographers, because when you have a specialist in topology in this group, in the *ethnos* that they attend, they have their way of organizing, of thinking about theorems (it is their *mathema*) and special techniques, and they have their way of proceeding (TICs). In the video, the mathematics educator conceptualizes, differentiates, and exemplifies Ethnomathematics, explaining the cultural, group, and human character of this area.

Ubiratan D'Ambrosio in the interview *Ethnomathematics* relates the opportunity given to him by the United Nations Educational, Scientific and Cultural Organization (UNESCO) to teach a course on Pure Mathematics in a Postgraduate course in the Republic of Mali (Africa). He exposed his perception of a conceptualization of Mathematics and Science that was worked on by the African peoples to build their society, economy, culture, arts, and daily lives, which differed from what was done in Europe. D'Ambrosio commented on the understanding of an education that takes place in the conviviality, the master, and the artisan, including an intellectual artisan. He also witnessed the elaboration of grammar, whose main resource was to listen to the oral testimonies of the griots[2]. He explains that Ethnomathematics is found in the study, observation, and analysis of this knowledge and doings in everyday situations and problems (D'Ambrosio, 2008; 2018).

[2] Maintainers of millennial African oral traditions, they are storytellers, able to reconstruct the past through words (Silva, 2013).

In *How Ethnomathematics Came About*, starting from the question "What does the West want to see in other countries?", the mathematics educator speaks of his interest in seeing what and how the history coming from these other peoples would be told and explained by them, and to see that this history is linked to mathematics. Understanding the locals, and how their members see their mathematical doing is what D'Ambrosio came to call Ethnomathematics. So, the idea is to listen to the locals, see what they do in their daily lives, how they explain and get by in their daily needs of mathematical nature, and see the processes of comparison, ordering, measuring, and quantification. Thus, Ethnomathematics would be a Mathematics that starts from what is done naturally, part of the organization of civilizations: to be mathematical in their reality. For the theorist, all stages of the evolution of the human species are stages where mathematical facts are recognized.

In the video *AEA Course – Nature of Mathematics*, when discussing the history of Mathematics, D'Ambrosio argues that Ethnomathematics is directly related to the development of humankind, as its survival depends on the relationship of human beings with space and time. To do this, man needs to observe, classify, order, quantify, measure, compare, and infer, that is, to do Mathematics. He also explains that Herodotus unknowingly already spoke of Ethnomathematics by considering the different cultures in his productions. D'Ambrosio (2018) states that the Greek historian observed different ways of doing Mathematics when he wrote about the mathematical knowledge of other peoples.

In the video *Brazilian Education 179*, which features Nilson José Machado, Ubiratan D'Ambrosio discusses Ethnomathematics explaining that everything comes from perception and that mathematics as we know does not exist in other cultural groups. It is a product of these groups, these societies, and so there are "distinct ways of mathematizing" (D'Ambrosio, 2019, p. 20). As such, Ethnomathematics focuses on expanding the idea of what and how mathematics and its diversity are thought of. Therefore, mathematical knowledge is indispensable to humanity and the development of each subject inside and outside school (Moura, Fraz, & Santos, 2021), because "[...]

it implies an analysis of how groups of human beings have generated forms, styles, arts and techniques of doing and knowing, of learning and explaining, how they deal with situations and solve problems in their daily lives, their natural and sociocultural environment" (D'Ambrosio, 2018, p. 191-192).

In the video *Life of a Scientist*, D'Ambrosio talks about how his life was constantly permeated by mathematics since he was the son of a mathematics teacher. He mentions the time he lived in the United States and how he was able to experience Mathematics research and teaching. He contrasts frozen Mathematics, whose focus is the transmission of content and the university entrance exams, with living Mathematics, which aims at understanding the world, explaining phenomena, and establishing relationships that need to consider the curiosity of children and young people. For the mathematics educator, an intervention must be done using mathematical instruments.

D'Ambrosio explains, in the video, how Ethnomathematics emerged in his trajectory from an experience on the African continent, where he was certain that "Mathematics is closely linked to History". This is because in historical evolution people make comparisons, measure, order, and quantify, which is essential knowledge to develop mathematical ideas, that we are all mathematical beings, and that Mathematics is inter and transdisciplinary. In Africa, he did a study on how the locals viewed their doing Mathematics and this opened a range of possibilities for understanding Mathematics. Thus, in the quest to understand how Africans thought and applied mathematics, Ethnomathematics was born. As D'Ambrosio (2018, p. 191-192) states, this brings in its core the "[...] investigation of the evolution of ideas, practices, and knowledge of the human species in different cultural environments."

It can thus be seen that the theme of Ethnomathematics appears in all six videos, in some of them as specific statements and in others as the main axis. What recurs is the defense of the existences of Mathematics (in the plural), a factor that problematizes the Eurocentric vision in force; the amplitude and relation of this concept with the search for the humanization of Mathematics, which is a unique social construction of

the human being and arises from the need of groups to solve daily problems in order to guarantee survival (strategies to staying alive and giving continuity to the species) and transcendence [asking where beyond the here (space) and how much beyond the now (time]; appreciation of the culture of different peoples and groups of human beings in their diversity, with emphasis on respect, solidarity and cooperation by means of an ethical attitude; that Ethnomathematics is a product of coexistence among human beings and that it is related to the evolution of the human species from the recognition of mathematical facts.

The importance of D'Ambrosio's stay in Africa for the constitution of Ethnomathematics is evident since, in most of the videos, he refers to this time and its relevance to the unveiling of the existence of different and diverse cultural constructions of mathematical knowledge.

FINAL CONSIDERATIONS

Ubiratan D'Ambrosio's legacy inspires the search for the new, for social justice, for Mathematics as a means of acting in the world in a more conscious, critical, respectful, supportive, cooperative, and ethical way.

O autor é referência da área e a plataforma democratiza o acesso ao conhecimento de forma fácil e contemporânea.

The audiovisual material available on the YouTube platform featuring the mathematics educator Ubiratan D'Ambrosio on Ethnomathematics contributes to the discussions. The author is a reference in the field of education, and the platform democratizes access to knowledge in an easy and contemporary way. In addition, it is another means of disseminating the concept and activities concerning Ethnomathematics since the author's production is explained more informally. A factor that enables understanding differently and, in some cases, interaction through the chats. The contribution of the videos to the field of Ethnomathematics is the dissemination, diffusion, and possibility of formation (self-training) utilizing social media and approximation with the concept arising from the theorist's speech.

Seeking the audiovisual language made possible by the Internet as a source of investigation allowed us to recognize the value of social media as a source of information, a means of knowledge since it made it possible to get to know Ethnomathematics through the resourceful speech of Ubiratan D'Ambrosio, who states the transforming potential of mathematics when recognized in the history of civilizations.

As far as Ethnomathematics specifically is concerned, it ranges from conceptualization with exemplification to differentiation from other concepts such as ethnicity, in other words, a possibility of access and understanding in a differentiated manner by means of oral communication. D'Ambrosio argues that Ethnomathematics is a cultural construction carried out by different groups in their daily lives in the search for survival and transcendence. It is important to note that the digital media are one of the ways of accessing information and knowledge; however, further study in any area requires the systematic reading and study of the works that deal with the subject.

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[3] Translated by the authors

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