PODCAST TAXONOMY: AN ANALYSIS FOCUSED ON THE PRODUCTION OF CONTENT FOR TECHNICAL EDUCATION

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ABSTRACT

Digital Information and Communication Technologies (DICTs) need to be constantly present in the didactic materials prepared by teachers, such as Podcasts. This article is a compilation of doctoral research regarding the elaboration of Multimodal Teaching Materials for technical disciplines and, to insertion of an innovative methodology through prototypes of multimodal classes using Podcast resources in the content of the Agricultural Technician. As no research was found regarding the preparation of multimodal teaching materials, research was carried out in Streaming applications, available on the Play Store, a virtual store available on the Android operating system, between August and November 2023, to describe an innovative methodology, through the Educational Podcast for the Technical Course in Agriculture with a view to its application in a real classroom context. In this perspective, we intend to address the theme, presenting data on the production of the different Podcast formats prepared for Technical Education in Agriculture and related areas. In this case, we believe that the ideal is to create a Podcast with different types of episodes, paying attention to the duration of each episode, as it should stimulate the user's reasoning and understanding.

Keywords: Podcast. Technical education. Cyberculture. Multimodality.

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INTRODUCTION

Digital Information and Communication Technologies (DICTs) need to be constantly present in the didactic materials prepared so that the student develops an individual awareness of learning and can develop a better exploration of the potential of each technological resource, highlighting the Podcast. Levy (1999) believes that when the student is subjected to new memory capacities, through technologies, in this case, the Podcast, his cognitive system increases and presents instruments that develop learning systems, with an exchange of information of technological knowledge between students and teachers. In this way, cyberculture is an interactive space favoring learning and professional training in the use of multimodal didactic material (Levy, 1999).

For this study, we will have as a theoretical reference the authors Lévy (1999), Felcher and Folmer (2021), Matias-Pereira (2019), Ramos (2010), Bardin (2016) Lavine and Dionne (1999) who are the basis of our reflection for the procedure of analysis of the production of content in Podcast taxonomy. We have listed these theorists and throughout the study, we will present other theorists who are interlocutors of these concepts.

When talking about Digital Information and Communication Technologies (DICTs), we remember the recent Law No. 14,533, of January 11, 2023, of the Ministry of Education of Brazil, which institutes the National Digital Education Policy (PNED) and presents Digital Inclusion, School Digital Education, Digital Training and Specialization, and Research and Development (R&D) in Digital Information and Communication Technologies (DICTs) as structuring axes, (Brazil, 2023). Law No. 14,533 aims to ensure the insertion of digital education in school environments, at all levels and modalities, by stimulating digital and informational literacy and learning aimed at the development of accessible and inclusive TDICs, with low-cost solutions. Santos and Sorte (2023), highlight that a decisive factor for teachers to use technologies in their classes is the availability of equipment and *internet* available in the classroom, in addition to the lack of continuing education on the use of technologies.

Felcher and Folmer (2021) conceptualize Education 5.0 as education that enables students to use technology healthily and productively, with socio-emotional, behavioral, and personal qualifications, attributing to each one the essence and ability to communicate, solve problems, emotions, teamwork, diversity, empathy, and ethics.

The Technological Professional Training of the Federal Institutes, among them, we highlight, in this context, the Technical Course in Agriculture Integrated to High School,

prioritizes human, citizen, and qualified training, oriented towards the integration between science, technology, and culture as inseparable dimensions of human life and intellectual development, whose curricular matrix considers Digital Information and Communication Technologies, facilitated by the physical facilities of the learning environments, with classrooms with technological equipment, computer labs, technical laboratories and other technological resources that facilitate the teaching and learning process. According to Macedo and Osório (2023), the implementation of TDICs in the Technical Course in Agriculture Integrated with High School improves the education system and adapts to the reality of students, digital natives, providing high learning rates and enabling confidence to face the setbacks of a professional life or an undergraduate degree.

When we observe the historical evolution of technology in agriculture and livestock, we realize that this rise is added to the training of the Agricultural Technician, given the technological devices used in classes, for example, geographic data processing software, for area mapping. Faced with this scenario, of new teaching practices, it is possible to re-signify what reaches the students of the Technical Course in Agriculture Integrated to High School, when it comes to using DICTs, indicating new perspectives for the student's involvement with their learning. We know that, in certain contents and disciplines, it is necessary to use active tools for interaction.

According to this context, we believe that Law No. 14,533 complements the training of Agricultural Technicians given their technological development as a digital native, since DICTs offer them the possibility of accessing their learning with greater propriety, taking into account their integral training. In this sense, we highlight Education 5.0, which in addition to relating all technological evolution, emphasizes the humanistic aspect of development.

Aiming at more complete and effective learning of students, focusing in this study the use of digital resources, such as Podcast, which can be used both in face-to-face classes and outside them, in addition to being used in hybrid teaching, which combines multiple spaces, time, activity and methodologies, can be a great opportunity to improve communication between students and teachers. I believe that the Podcast makes the class more flexible, connecting teaching and learning for students in different spaces and times. In this sense, Baumgratz and Santos (2024) believe that the lack of digital resources can intensify the already existing inequality in education, hindering the individual development of each student.

Podcasts are genres with several subdivisions, so this work aims to discuss Podcast formats produced for classes in the Technical Course in Agriculture Integrated into High School, in the discipline of Infrastructures, in the content of Topography since we believe that it stimulates legitimacy in teaching and learning. In this perspective, we intend to address the topic by presenting data on the production and taxonomy of Podcasts prepared for Technical Education in Agriculture and in related areas, based on the evaluation of the Podcasts found in *Streaming applications*. In the area of education, taxonomy is any classificatory system of categories that encompasses learning and an instrument that allows allocating, retrieving, and communicating information within a didactic material (Matias-Pereira, 2019).

To obtain this data, a survey was carried out between August and November 2023 on the *Play Store*, the virtual store of the Android operating system of Streaming applications that host Podcasts with the contents of the Technical Course in Agriculture. For the discussion of this article, the themes will be grouped into three major topics: the Technical Course in Agriculture Integrated to High School and its technologies, the methodology used in the work, and the results, discussions, and conclusions about the production of Podcast content.

THE TECHNICAL COURSE IN AGRICULTURE INTEGRATED WITH HIGH SCHOOL AND ITS TECHNOLOGIES

The Technical Course in Agriculture Integrated with High School emphasizes scientific, humanistic, and technological education, in addition to considering the agricultural, social, and economic productive context in integral human formation, in addition to involving the dimensions of work, science, and culture (IFFar, 2019). The Technical Course in Agriculture is instituted through the guidelines stipulated in the National Catalog of Technical Courses (CNCT), instituted by MEC Ordinance No. 870, of July 16, 2008, based on CNE/CEB Opinion No. 11/2008 and CNE/CEB Resolution No. 3/2008, and is constantly updated to contemplate new social demands (Brasil, 2008).

Integrated High School becomes inseparable from professional education, since the curricular contents are not dissociated, guaranteeing students the unitary basis of general training and preparation for the exercise of technical professions (Ramos, 2010). It is important to note that the exploration of digital technologies can provide students from the

Technical Course in Agriculture Integrated to High School with greater engagement with the learning process and also a more technical and human exploration of technologies.

It is relevant to justify that the use of digital resources such as Podcast, whose use is given by an innovative methodology with a language accessible to the age group of high school students, contemplates the didactic possibilities of a resource that is usable by young people, in addition to being a habitual language and that can be considered a didactic possibility, and the teacher uses it for learning purposes, incorporating it into his class method.

Cyberculture is also related to the didactic life of the teacher who makes use of the content he will work on in the classroom and that can be associated with an innovative methodology in which he produces and the student uses digital content so that through this interaction, he also learns.

An important point for the empowerment of students of Technical Courses in Agriculture integrated with High School is to be critical and creative in the use of digital technologies since their knowledge and control also serve as instruments of liberation (Lapa, 2019).

METHODOLOGY

Research is a set of indicators that provides us with the scientific investigation of a given reality. Cerutti (2021) points out that science builds knowledge by developing new theories, and principles, defining results, and taking into account factors that enable the construction of knowledge. In this sense, Minayo (2017) highlights that to do science, it is necessary to work simultaneously with theory, method, and techniques, in addition to the fact that the quality of an analysis depends on the researcher's experience and capacity for deepening.

The study uses content analysis as the main approach. According to Bardin (2016), the emergence of technologies has expanded this analysis to include new signs, such as sounds, images, animations, videos, and games. This multiplies its applications in technological innovation. Therefore, content analysis must be applied to all forms of communication, enriching and confirming findings.

Research goes a long way to reach the formal approach, which ranges from initial theoretical research to data collection and interpretation. With the understanding of developing research based on the reliability of knowledge production, we emphasize that

qualitative research brings us evidence of commitment to the qualitative approach to data collection and analysis. Minayo (2017) defines "Qualitative Research" as being that deals with intensity, singularity, and meanings, as inherent to acts, relationships, and social structures, in addition to being able to solve problems, which are part of their contingency and condition, which make it difficult to know in advance whether the information collected and the analyses can be considered valid and sufficient.

We named the research as a documentary virtual investigation because it found and identified Podcasts that did not receive treatment from the researcher and could contribute to the documentary and content analysis, emphasizing the itinerary of the decisions that must be made, from the elaboration, classification of the material to the elaboration of the analysis categories (Pimentel, 2001).

Virtual educational content analysis is a qualitative research technique that involves the systematic analysis of digital materials, such as texts, images, videos, audio, and interactions on online platforms, allowing researchers in the field of education to obtain clarity in the results. Bardin (2016) emphasizes in his book "Content Analysis" the importance of creating analysis categories that are pertinent to the objectives of the study. In this way, the analysis of the elaboration of multimodal teaching materials using podcasts can be carried out in an organized and systematic way, ensuring an in-depth and rigorous understanding of the effectiveness and impact of these resources in the teaching and learning process.

The Technical Course in Agriculture Integrated with High School has complex technical disciplines for student learning, among them is the discipline of Topography, which is essential for the Agricultural Technician professional due to its importance in various activities such as soil management, planning of agricultural and livestock projects, management of rural properties, drainage, irrigation, demarcation of properties, preparation of maps, monitoring, and control of pests, among others.

The Technical Courses do not have ready-made teaching materials for the technical subjects, and it is up to the teacher to prepare his or her teaching material. In this way, as no research was found regarding the elaboration of multimodal didactic materials for technical disciplines and, to insertion of an innovative methodology through prototypes of multimodal classes using Podcast resources in the content of the Agricultural Technician, research was carried out in Streaming applications, available on *the Play Store*, a virtual store available on mobile devices with Android operating system*,* between August and

November 2023. We can find several mobile technologies, among the best known is *Android*, which is the technology used by *Google* and in the most popular smartphone models. In this way, we chose to carry out the research in the *Play Store* application, due to its accessibility to teachers in the public school system.

This survey is necessary to have more knowledge on the subject and how many Podcasts are produced by teachers to have a position on the importance of this study.

The study prioritized three stages of data collection. The first took place in the Play *Store*'s virtual store, using the descriptors "Educational Podcasts", "Educational Podcast" and "Podcast" to evaluate the number of Streaming apps available for free on the *Play Store*.

However, to deepen the analysis of Podcast for Technical Education in Agriculture, the second stage of the research was carried out in each of the *Streaming* applications available on the network for free, using as descriptors the name of the contents of the Technical Course in Agriculture Integrated to High School: "Topography", "Irrigation", "Rural Constructions", "Agricultural Machinery", "Agriculture", "Soils", "Fruit Growing", "Forestry", "Garden Farming", "Olericulture", "Food Technology", "Cattle Farming", "Pig Farming", "Poultry Farming", "Beekeeping" and "Bee", in addition to the related area "Mathematics", "Chemistry", "Physics" and "Biology". Using the descriptors with this spelling, a Podcast with the language in Portuguese, Spanish, and Italian was found in 34 Streaming applications. For the analysis of each Podcast found a new refinement was carried out. Only Podcasts produced by teachers, students, or researchers, in Portuguese, with uploads from 2020 and with more than 10 episodes, were selected for the next stage.

For the evaluation of the selected Podcasts, we developed an "Educational Podcast Observation Matrix" based on the concepts of Laville and Dionne (1999), which consists of specifying indicators that establish a link between the observations: tangible signals that will allow us to make decisions, make choices, issue criticisms and define the educational values of the Podcasts. For the elaboration of this article, we listed technical and didactic indicators such as in which digital platforms they were found, who are their producing agents, what is the area of agricultural education or if they were from related areas. Also, indicators were used according to the taxonomy, that is, its type, its duration, the format of the audio, the structure, characteristics such as inspiration, creativity, innovation and interactivity, periodicity, language, design, audio quality, and its sources of reference.

RESULTS AND DISCUSSIONS

In the research carried out with the Android operating system, the *Play Store*, 154 Streaming applications were found. These applications were installed on the *smartphone* to research the existence of a Podcast with the contents of the Technical Course in Agriculture Integrated to High School.

From the search in the apps, it was possible to find Podcasts in only 34 *Streaming apps*. Thus, we found eight (8) *playlists* on topography, four (4) on pig farming, five (5) on poultry farming, three (3) on irrigation, three (3) with the terms beekeeping and bees, four (4) on agriculture, two (2) on olericulture, 13 on food technology, 31 on mathematics, 37 on chemistry, 19 on physics and 52 on biology playlists. With the descriptors soils, rural buildings, cattle farming, fruit growing, forestry, gardening, and agricultural machinery, no playlist was found.

To evaluate the most significant Podcasts for the research, we selected those that were *uploaded* from 2020 onwards, with more than ten episodes, and whose producing agents were teachers, students, or researchers. Through the Educational Podcast Observation Worksheet, each selected Podcast was listened to and observations were made. Table 1 presents the *playlists* with the technical content of the Technical Course in Agriculture studied, the *Streaming platforms* where they were found, the year of *upload,* and the number of episodes.

Table 1: Podcast of content from the Technical Course in Agriculture found for free in streaming apps on the Play Store

Playlist name	Streaming Platforms	Year Uploaded	Episodes
Surveying Podcast (Topography)	Rádio.pt – Radio and Podcast; Audials; Procast – The Podcast App; GetPodcast.	19 Jan. until Dec. 20. 2021.	10
Agropodcast – By Milena (Agriculture)	Audials.	26 Mar. until 12 Apr 2021.	11
Meliposphere – The Fantastic World of Bees (Beekeeping)	Podbean; Go Podcast; Podcasts Tracker; Republic Podcast; Anytime; Rádio.pt – Radio and Podcast; Momento Pod; Goodpods; Audials; GetPodcast.	25 May. Until 27 May. 2023.	12
Food Technology Podcast (Food Technology)	Guru Podcast; Turtlecast; Podverse; Podopolo; Overhaul FM; Aurelian.	03 Sep. 2021 until 21 Jul. 2022.	16
Pet Cast – Food Engineering (Food Technology)	Podcast Radio Music Cast; Moment Pod.	22 Apr. 2021 to 25 Oct. 2023.	31
Food Connection (Food Technology)	Podcast Radio Music Cast; Sprewell Podcast Player; Republic Podcast; Rádio.pt – Radio and Podcast; Audials; Podopolo; Procast – The Podcast App.	20 Apr. 2021 to 23 Nov. 2021 2023.	52
Jenipapo (Food Technology)	Podcast Radio Music Cast; Podcast Addict; Podurama; Guru Podcast; Podcast Reader – Podbean; Go Podcast; Turtlecast; Republic Podcast; Anytime; Rádio.pt – Radio and Podcast; Momento Pod; Goodpods – Podcast Player; Audials; Podcast Hub; Bullhorn; Capsule; Podopolo; Noorami; Procast – The Podcast App; Overhaul FM; Get Podcast; Aurelian.	13 Oct. 2020 until 08 Nov. 2023.	31

Source: Katia Zardo, 2023.

We emphasize that the Podcasts found in the table described above will be points of analysis based on the items: playlist name, streaming platform, year of upload, and number of episodes.

This study, which we will proceed to our analysis, is based on the doctoral thesis, which provides for the elaboration of multimodal didactic material for the disciplines of Infrastructures, which encompass the contents of Topography, Irrigation, Rural Construction, and Agricultural Machinery, only one playlist entitled Surveying Podcast was found. The first Podcast in this playlist was uploaded on January 19, 2021, and the last on December 10, 2021, totaling ten episodes. This playlist has as producing agents the teachers of the Technical Course in Surveying at the Federal Institute of Santa Catarina (IFSC) during the Covid-19 pandemic to assist students in Online Teaching.

This Podcast deals with issues in the area of expertise of the Surveying Technician, so some of the Podcasts are interviews with professionals in the area and last an average of one hour. Thus, when thinking about the elaboration of a Podcast for the elaboration of

multimodal didactic material, these episodes have a duration where it becomes tiring for the adolescent to listen. As for its taxonomy, we find different types of episodes, that is, informative expository, basic content, and current affairs, all in MP3 audio format. Its structure all episodes have a vignette with music, introduction, development, discussion, and closing, in addition to having the characteristics of innovation and interactivity. We can find technical and educational language, according to the producing agents. The design of the playlist we consider to be attractive, intuitive, and with different colors, since it has a black background with the symbol of the Federal Institute, with a graphic element that represents topographic equipment installed superimposed on the Institute's logo, the episodes have normal and clean volume audio and do not have references.

In the area of Agriculture, we find only one Streaming application Audials, the only playlist in the area, the Podcast AgroPodcast By Milena with 11 episodes, presenting the contents of the disciplines of Soils and Olericulture. Audials are not only installed on Android but can also be installed on Windows, which makes it easier for the teacher to process the audio. The first episode was uploaded on March 26, 2021, and the last episode was on April 12, 2021, that is, it did not have an upload periodicity. We believe that this playlist was designed to send content online to students during Remote Education. This playlist has the teacher as its production agent, and we consider the taxonomic script suitable for students of Technical Education Integrated into High School, since its type is basic content, of the 11 episodes in MP3 audio format, six are up to five minutes long and five episodes with duration ranging between five and ten minutes. As for the structure, it has a vignette with music, introduction, development, conclusion, and closing, we highlight inspiration and creativity as its main characteristics, in addition to having an educational language. Its creative design represents the two contents, the soil with a germinating seed that resembles a vegetable crop. Regarding audio quality, it has normal and clean volume, but the episodes have no reference.

In the Animal area, we find the Playlist Meliposphere: The Fantastic World of Bees, about the technical content of Beekeeping. This playlist consists of 12 episodes in MP3 audio format and the episodes were uploaded between May 25 and 27, 2023. It was recorded by Beekeeping professionals, with basic beekeeping content for a beekeeper training course, in this way, the narration resembles the format of a documentary, which makes it a technical language, that is, not didactic for students of High School Integrated to Technical Education. Podcasts have loud audio and noise in the background. Because they

are part of a course, the audios leave something to be desired, in addition to having no references or links to other content, which could make the playlist more attractive and with a greater number of accesses. Its structure only has a vignette with music and the initial design of the playlist is attractive and intuitive, as it has a colorful image that represents the universe of bees, where the center of the universe is planet earth and is surrounded by bees. This playlist is repeated in ten Streaming applications.

Podcast: The food Technology Podcast is coordinated by the professor and produced by undergraduate and graduate students of the Food Technology discipline at the Federal University of Minas Gerais (UFMG), PetCast – Food Engineering is produced by students of the Tutorial Education Program (PET) of Food Engineering at the Federal University of Rio Grande (FURG), the Food Connection Podcast is part of an extension project in the area of food science and technology at the Federal University of Pernambuco, from the Barreiras Campus, which began on April 20, 2021, to the present moment and the Jenipapo Podcast, which is a project of three professors and five students from the Food Engineering Course at the State University of Feira de Santana (UEFS), consisting of 31 episodes, ranging in length from one minute per episode to episodes over an hour long. We highlight that these Podcasts were produced by teachers and students of Higher Education, so the scientific and educational language is not the same language used in High School, which is more humanized so that students have a greater understanding.

When thinking about the Podcast taxonomy to be used in multimodal classes, these Podcasts left something to be desired, since they do not have episodes of basic content or content review, in addition to having episodes lasting more than 20 minutes. Regarding its structure, we observed that both have a complete structure, that is, a vignette with music, introduction, development, discussion of the content, conclusion, and closing. When evaluating their taxonomic characteristics, Jenipapo and Conexão Alimentos stand out for having inspiration, creativity, innovation, and interactivity. Playlists do not have reference sources, but they do have contacts and social networks and their design is attractive, intuitive, and colorful. The name Jenipapo was given in honor of the northeastern fruit of the same name, in the initial design, it has gears symbol of engineering, with arrows that direct people and food, in addition to the headset a symbol that represents audio. The Food Connection Podcast has a circle formed by various foods and in its center the wi-fi symbol.

Table 2 presents the playlist with the contents related to the Technical Course in Agriculture studied, the Streaming platforms where they were found, the year of upload, and the number of episodes.

Table 2: Podcast of disciplines in the area related to the Technical Course in Agriculture found for free in streaming applications on the Play Store

Playlist name	Streaming Platforms	Year Uploaded	Episodes
Mathematics – Mathematics for the Visually Impaired (Mathematics)	Podcast Radio Music Cast; Podcast Addict; Guru Podcast; Podcast Reader – Podbean; Go Podcast; Podcasts Tracker; Turtlecast; Republic Podcast; Anytime; Rádio.pt – Radio and Podcast; Porverse; Momento Pod; Fountain Podcast; Goodpods – Podcast Player; Podcast Hub; Bullhorn; Capsule; Podopolo; Noorami; Procast – The Podcast App; Overhaul FM; Get Podcast; Aurelian.	13 Dec. 2019 until 20 May. 2021.	142
Cast Math (Math)	Podcast Radio Music Cast; Guru Podcast; Podcast Reader – Podbean; Go Podcast; Rádio.pt – Radio and Podcast; Momento Pod; Fountain Podcast; Goodpods – Podcast Player; Podcast Hub; Capsule; Podopolo; Noorami; Overhaul FM; Get Podcast; Aurelian; Audials; Pocket Cast – Podcast Player.	16 Nov. 2020 until 05 Nov. 2021.	15
Químicast – The podcast that has chemistry! (Chemistry)	Podcast Radio Music Cast; Podurama; IVoox Radio and Podcast; Podcast Addict; Guru Podcast; Podcast Reader – Podbean; Go Podcast; Podcaster App; Podcasts Tracker; Republic Podcast; Anytime; Rádio.pt – Radio and Podcast; Porverse; Momento Pod; Fountain Podcast; Goodpods – Podcast Player; Podcast Hub; Bullhorn; Capsule; Podopolo; Noorami; Procast – The Podcast App; Overhaul FM; Get Podcast; Aurelian.	17 Jan. 2020 until 20 Nov. 2022.	22
Prof. Sunderland (Chemistry)	Podcast Radio Music Cast; IVoox Radio and Podcast; Podcast Addict; Guru Podcast; Podcast Reader – Podbean; Go Podcast; Podcasts Tracker; Anytime; Rádio.pt – Radio and Podcast; Momento Pod; Fountain Podcast; Goodpods – Podcast Player; Bullhorn; Capsule; Noorami; Overhaul FM; Get Podcast; Aurelian.	01 Feb. 2020 until 13 May. 2020.	13

Chemistry Talk (Chemistry)	Podcast Radio Music Cast; IVoox Radio and Podcast; Guru Podcast; Podcast Reader – Podbean; Go Podcast; Podcaster App; Podcasts Tracker; Republic Podcast; Rádio.pt – Radio and Podcast; Porverse; Fountain Podcast; Goodpods – Podcast Player; Podcast Hub; Bullhorn; Capsule; Podopolo; Noorami; Procast – The Podcast App; Overhaul FM; GetPodcast; Aurelian; Pocket Casts – Podcast Player.	18 Jun. 2021 to 22 Nov. 2023.	60
Dynamic Physics with André Paranaguá (Physics)	Podcast Radio Music Cast; IVoox Radio and Podcast; Podurama; Guru Podcast; Podcast Reader – Podbean; Go Podcast; Podcaster App; Podcasts Tracker; Republic Podcast; Anytime; Rádio.pt – Radio and Podcast; Porverse; Momento Pod; Fountain Podcast; Goodpods – Podcast Player; Audials; Podcast Hub; Capsule; Podopolo; Noorami; Procast – The Podcast App; Overhaul FM; GetPodcast; Aurelian.	17 Jun. 2020 until 30 Mar. 2023	15
Fisicast (Physics)	Podcast Radio Music Cast; IVoox Radio and Podcast; Guru Podcast; Pocket Casts – Podcast Player; Podcast Addict; Podcast Reader – Podbean; Go Podcast; Podcaster App; Anytime; Rádio.pt – Radio and Podcast; Momento Pod; Porverse; Fountain Podcast; Goodpods – Podcast Player; Podcast Hub; Capsule; Podopolo; Noorami; Procast – The Podcast App; Bullhorn; GetPodcast; Aurelian.	27 Dec. 2018 to 13 Jun. 2023	159
Biology in Half an Hour (Biology)	Podcast Radio Music Cast; Guru Podcast; Pocket Casts – Podcast Player; Podcast Addict; Podcast Reader – Podbean; Go Podcast; Podurama; Podcasts Tracker; Anytime; Rádio.pt – Radio and Podcast; Porverse; Momento Pod; Goodpods – Podcast Player; Podcast Hub; Audials; Noorami; Procast – The Podcast App; Overhaul FM; GetPodcast; Aurelian.	07 Feb. 2023 until 24 Nov. 2023.	43
Biology of Quengo (Biology)	Podcast Radio Music Cast; Addict.	19 May. 2020 until 15 Jan. 2021.	21
Science and Biology (Biology)	Podcast Radio Music Cast; Guru Podcast; IVoox Radio and Podcast; Podcast Addict; Podcast Reader – Podbean; Turtlecast; Go Podcast; Podurama; Podcasts Tracker; Anytime; Rádio.pt – Radio and Podcast; Porverse; Momento Pod; Goodpods – Podcast Player; Podcast Hub; Audials;	26 Oct. 2019 until 03 Mar. 2021.	50

	Fountain Podcast; Bullhorn; Podopolo; Noorami; Procast – The Podcast App; Overhaul FM; GetPodcast; Aurelian.		
Venturing Into Biology (Biology)	Podcast Radio Music Cast; Guru Podcast; IVoox Radio and Podcast; Podcast Addict; Podcast Reader – Podbean; Turtlecast; Go Podcast; Podurama; Podcaster App; Podcasts Tracker; Anytime; Rádio.pt – Radio and Podcast; Porverse; Momento Pod; Goodpods – Podcast Player; Podcast Hub; Audials; Fountain Podcast; Bullhorn; Podopolo; Capsule; Noorami; Procast – The Podcast App; Overhaul FM; GetPodcast; Aurelian;	06 Feb. 2020 until 19 Jul. 2022.	24

Source: Katia Zardo, 2023.

We highlight that the podcasts listed in the table above will be analyzed based on the items mentioned. In the survey of the technical area, we found a few Podcasts, so we carried out research in the area related to the Technical Courses in Agriculture, which are: Mathematics, Chemistry, Physics, and Biology. In this case, in Mathematics we find the Podcast Matematicast: mathematics for the visually impaired and the Mathematics Cast. The Podcast Matematicast was created by a mathematics teacher to bring basic mathematics content in an accessible way to the visually impaired. Each episode was designed with a clear and easy educational language to favor student learning. Through the audio resource in MP3 format, the visually impaired student has the opportunity to pause the audio, go back to listen to the content again, and thus make their records of the content according to their needs. We can highlight the importance that the professor gave to Digital Information and Communication Technologies (DICT) since this program began on December 12, 2019, when classes had not yet been stopped in Brazil due to the Covid 19 pandemic. The Math Cast, episodes are produced by the math teacher for their free basic math course. This Podcast consists of 15 episodes in MP3 format *uploaded* between November 16, 2020, and November 5, 2021. Only one episode is longer, exceeding an hour in length, considered an interview, the other episodes are no more than 15 minutes long. In this sense, we believe it is a non-tiring duration that holds the attention of students. The episodes of Mathematics Cast have reference sources, which is a *link* that directs the student to download the Basic Mathematics Course E-book.

As for the taxonomy of the episodes, the two *playlists* are of the basic content and content review type with the resolution of questions for entrance exams and the National High School Exam (ENEM). We believe that the structure of the episodes is suitable for

Educational Podcasts since they have a vignette with music, an introductory part of the content, development, discussion, and conclusion of the content, and a closing link to the next episode. We also highlight that the episodes have characteristics of inspiration, creativity, and innovation since they are Podcasts produced to be distributed free of charge to students, in addition to having a basic educational language that facilitates the students' understanding when listening to the audio. The audio quality is normal, but it has noise in the background. The *design* of the two *playlists* is attractive and intuitive. Regarding colors, the Mathematics Cast features a brain with mathematical formulas on its left side, which represents logical reasoning, while the right side which represents creativity is colored, while the Podcast Matematicast has a logo with a black background and an overlapping brain drawn by white triangulation lines.

In the Chemistry Podcast survey, the following were selected: Quimicast: the Podcast that has chemistry! Prof Sunderland (Chemistry) and Chemistry Talk. Regarding taxonomy, the three Podcasts are of the basic content and informative expository type, but Quimicast and Papo de Química are more complete, where they bring content review, interviews, and current affairs. They bring the complete taxonomy of characteristics, with inspiration, creativity, innovation, and interactivity. The three *playlists* have an educational language, their design is considered disharmonious and barely noticeable, and have no references. We highlight that the professor responsible for the Papo de Química Podcast is a professor of the Technical Course in Chemistry at the Federal Institute of Pernambuco, so it is a Podcast with a profile for Technical Education. In addition, we highlight that the teacher in some episodes talks about the use of games and digital tools to improve the interaction of the content with students.

From the selection of the Physics Podcast to analyze, we have the Fisicast, Dynamic Physics with André Paranaguá and Dr. Physics. We highlight that the Dynamic Physics Podcast with André Paranaguá is the one that least fits the taxonomy that we consider to be the ideal, that is, about its type, all episodes are basic content, with its first *upload* on June 17, 2020, we believe that this *playlist* was created for students to use during the Covid 19 pandemic, However, the professor added more subsequent episodes, including in 2023. In this sense, we highlight that the structure has no vignette, no ending or music, which makes us realize how attractive the vignette with music is, as it produces a differential to the Podcast, where it gives time for the listener to connect. Dr. Physics is

produced by the teacher and aimed at high school students, discussing questions of entrance exams and ENEM.

We consider Fisicast as an innovation in terms of DICTs, since its first episode was released on December 27, 2018, that is when most teachers still did not adhere to digital technologies in their entirety. It was produced by a group of physicists who speak in a humorous way about science, and physics, ranging from high school and college subjects to research topics. Although the structure is not complete in both Podcasts, they all have characteristics of creativity, inspiration, and innovation, and Fisicast has interactivity since the episodes are recorded in groups of people. This interactivity between the physical ones, in addition to audio quality with normal and clean volume, makes it an attraction to listeners, since they manage to make a fun and light scientific and educational language in a way that holds our attention.

In the search for Biology Podcast, we selected four *playlists*, Science and Biology which, like Fisicast, emerged before the pandemic, which we consider teachers linked to DICTs. This Podcast has a taxonomy of the basic content type, its innovation characteristic, and its *design* was produced in an attractive, intuitive, and colorful way, but because it is a *playlist* produced in 2019 and is a new technology, even without a vignette, discussion, and closure, we believe that if this *playlist* If it were to continue today, these missing issues would be solved. Regarding the Podcast Venturing Through Biology, Biology of Quengo and Biology in Half an Hour, both have an educational language, but Biology in Half an Hour also has a scientific language. The 43 episodes of Biology in Half an Hour were uploaded to *Streaming* applications during the year 2023 and as it is a Podcast produced by professors and researchers, for the Higher Education audience, they are informative expository and content review episodes, in addition to the episodes having references. We highlight that the Biology Podcasts produced for high school students do not have references, but both are creative to hold the attention of students. In this regard, we highlight the Podcast Biologia do Quengo, produced by the Biology teacher at the Federal Institute of Rio Grande do Norte and aimed at students of Technical Education Integrated into High School stands out for their creativity, since several of the episodes are parodies of well-known songs containing Biology content. However, we believe that the episodes were not recorded in studios, since some episodes have high volume and others low volume and with noise. It is worth remembering that most Educational Institutions do not have a studio, which because they are teaching Podcasts, does not become a problem.

FINAL CONSIDERATIONS

With an in-depth study on the existence of Podcasts for Technical Education, we observed the inexistence of exclusive Podcasts for use in multimodal classes for the disciplines of the Technical Course in Agriculture Integrated into High School. Zardo and Cerutti (2022) highlight the lack of research on the use of multimodal tools in the other technical disciplines of the Technical Course in Agriculture.

Educational podcasts can no longer be overlooked, given that students are increasingly familiar with their use. In podcast production, it's crucial to follow a well-defined taxonomy, as it directly influences the listener's experience through its organizational components. Thus, we conclude that the ideal taxonomy for educational podcasts should consider several aspects: the type of podcast, the duration, the number of episodes, the format and quality of the audio, the structure of the episodes, the characteristics of inspiration, creativity, innovation, and interactivity of each episode, the periodicity, the language, the design, and the reference sources. Adopting this systematic approach ensures that podcasts meet pedagogical criteria and maintain listener engagement.

When students search for podcasts on streaming apps, those with an attractive, intuitive design and distinctive, colorful logos tend to capture their attention. Notable examples include "Meliposfera", "AgroPodcast By Milena", "Conexão Alimentos", "Jenipapo" and "Matemática Cast". The visual appearance of these podcasts makes it easy for students to initially attract them to explore their playlists.

To meet the needs of high school students, it is recommended to create podcasts with different types of episodes, adapting the length of each one to maintain the stimulus of reasoning and understanding without becoming tiring. The language used must be accessible and engaging. Elements such as inspiration, creativity, and innovation are crucial, as exemplified by the "Podcast Biologia do Quengo", whose parodies remain in the memory of listeners for days, demonstrating the effective use of pedagogical resources to promote learning.

We argue that an adequate structure for podcast episodes should include several essential components to ensure their educational effectiveness. First, the musical vignette is essential to establish the identity of the podcast. Then, the introduction should contain a brief synopsis of the episode, preparing listeners for the content that will be covered.

The development of content must be underpinned by rigorous scientific foundations, ensuring the accuracy and relevance of the information presented. When necessary, a

discussion section should be included to deepen the critical analysis of the topic. The conclusion of the episode should summarize the main points addressed, providing a coherent closure. Finally, the closure should reiterate the identity of the podcast and ease the transition to future episodes.

In addition, we consider it crucial to include, in addition to the reference sources, a detailed descriptive text of the episode's content, providing listeners with an additional resource for reviewing and deepening the material presented.

We can reflect on student learning when we make use of Podcasts that, in addition to the positive contributions of their insertion, can cause greater mastery of the subjects that can be heard outside the classroom. We emphasize that digital tools, when well used in the classroom, influence students to be more critical and questioning and show that we need to use multimodal teaching materials. In this sense, we emphasize the importance of preparing a material containing the ideal taxonomy for the elaboration of a Podcast, in this study, based on Technical Education in Agriculture, which makes this production attractive to teachers, remembering that it can be adaptable to any teaching segment.

We also understand that this study allows us to new research on the production of different Podcast formats, for teaching Technical Courses in Agriculture Integrated into High School, since there is still a scarce source of methods that can be used by teachers, in this teaching modality, such as the elaboration of multimodal didactic content and through Podcast. It should be noted that the study focused on Technical Courses, but it can be adapted to any educational segment, such as Elementary, Secondary, and Higher Education, which can make use of multimodality for the production of didactic content.

It is concluded that to produce a podcast based on a taxonomy for its systematic elaboration, it is necessary to consider several indicators. These indicators include the type of podcast, the length of the episodes, the audio format, and the structure. In addition, characteristics such as inspiration, creativity, innovation, and interactivity are essential. Other important factors are the periodicity, the language used, the design, the quality of the audio, and the reference sources. Carefully evaluating these aspects ensures that you create an effective and engaging educational podcast.

Finally, teachers must incorporate digital technologies in Technical Education in Agriculture, since such technologies contribute to learning, stimulating the student's reasoning and understanding, and providing use in various areas of knowledge. Therefore,

the elaboration of didactic materials using a Podcast shows new perspectives on the interaction of student, teacher, and content.

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