TECHNOLOGY, DIDACTICS AND PEDAGOGY AS FOUNDATIONAL TOOLS FOR EDUCATION

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Summary
A documentary review was carried out on the production and publication of research works related to the study of the variables ICT, Pedagogy and Education. The purpose of the bibliometric analysis proposed in this document was to know the main characteristics of the volume of publications registered in the Scopus database during the period 2017-2022, achieving the identification of 408 publications. The information provided by this platform was organized through graphs and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics have been described, the position of different authors regarding the proposed theme is referenced through a qualitative analysis. Among the main findings made through this research, it is found that India, with 66 publications, was the country with the highest scientific production registered in the name of authors affiliated with institutions in that nation. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material related to the study of Education through innovative strategies was Social Sciences with 288 published documents, and the most used Type of Publication during the period indicated above were Journal Articles with 59% of the total scientific production.

Keywords: *ICT tools, didactics, teachers, classroom plan, teaching - learning*

Nowadays, information and communication technologies (ICTs) have played a fundamental role in today's society. From the economic, productive, scientific sector to the educational sector, which have presented a series of transformations due to the effects of globalization. Around the world, many economies have chosen to incorporate ICTs in education, as the rise of globalization has created a global idea of knowledge. According to him, he states that today's society lives in a world dominated by science and technology and the use of these are generating new ways of learning. (SÁNCHEZ, 1999) However, the incorporation of ICT into education has become a process, since it is not only focused on technological tools, these new technologies are more, it is about shaping educational environments, where a didactic construction is developed and in this way be able to consolidate significant learning based on these technologies. In addition to improving didactic planning and improving teaching processes. . As we advance, ICTs have undergone a process of transformation, managing to be an essential part of educational instruments, this tool has the ability to improve the quality of education, from improving internal processes, to the educational quality of students, having the ability to revolutionize the way information is obtained, handled and interpreted. .(Díaz-Barriga, 2013)(Aguilar, 2012)

Within the roles of each educational agent, students today use this new tool with the purpose of improving and facilitating their learning processes, this progress has been such that these resources have become an essential tool for education, where the constant search to improve learning brings

with it the implementation of technology with education. This is where teaching professionals play an important role in these processes of transformation in education, since the teaching-learning process is being completed, one of the characteristics in the use of ICT lies in breaking the traditional paradigms of education and taking a step towards the teaching function. where they must be trained and update their pedagogical methodologies according to current requirements. (Granados, 2015)

The incorporation of ICT in a learning environment allows students to be able to become the protagonist of their own learning, allowing academic flexibility, new learning styles and also promoting self-learning, these characteristics play an important role in education, since virtual education and new didactic methods have become a revolution and where the use of these new technologies have emerged to propose new both educational and pedagogical paradigms.

However, this incorporation is not without challenges since, according to the inclusion of ICT in the education sector, it must be accompanied by a series of factors in which a frame of reference is defined with the aim of making decisions regarding the actions carried out during the teaching process. The first factor lies in the fact that information is linked to access, modelling and transformation of new knowledge in digital environments, secondly, communication, which is focused on collaboration, teamwork and technological adaptability and, finally, ethics and social impact, which is linked to the essential skills to be able to face future ethical challenges based on globalisation and the rise of ICTs. When addressing these factors, inclusion in education and improving educational processes in students are sought. For this reason, this article seeks to describe the main characteristics of the compendium of publications indexed in the Scopus database related to the variables ICT, Pedagogy and Education, as well. Such as the description of the position of certain authors affiliated with institutions, during the period from 2018-2023.(Tapia, 2013)

2. GENERAL OBJECTIVE

To analyze, from a bibliometric and bibliographic perspective, the preparation and publication of research papers in high-impact journals indexed in the Scopus database on the variables ICT, Pedagogy and Education, during the period 2018-2023.

3. METHODOLOGY

This research has been the result of the systematization of all the technological tools that were used by practitioners of the DTI subject in the period 2018 - 2021, during the realization of their pedagogical practice in public and private schools in Tunja. That is why the qualitative paradigm was worked with a descriptive approach since a systematization of the ICT tools was carried out, semester by semester of the lesson plans that were used. The program in which the systematization was carried out was Excel and later they were categorized according to the strategy that a teacher could use in class. The target population was around 140 student interns who oriented the area of technology and Computer Science (hereinafter T&I).

The purpose of the LIT is to guide students in their role as teachers using ICT as pedagogical and didactic mediators in their teaching processes. It is in this context that the DTI subject of the UPTC aims to prepare the future graduate in the creation of different pedagogical strategies that allow him to design resources or didactic aids with active methodologies according to the capacities of children and young people at the preschool, elementary school, secondary and middle school levels.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach of the scientific production corresponding to the study of ICT, Pedagogy and Educationa qualitative perspective, examples of some research works published in the area of study indicated above, starting from a bibliographic approach that allows describing the position of different authors regarding the proposed topic. It is important to note that the entire search was carried out through Scopus, managing to establish the parameters referenced in *Figure 1*.

3.1. Methodological design

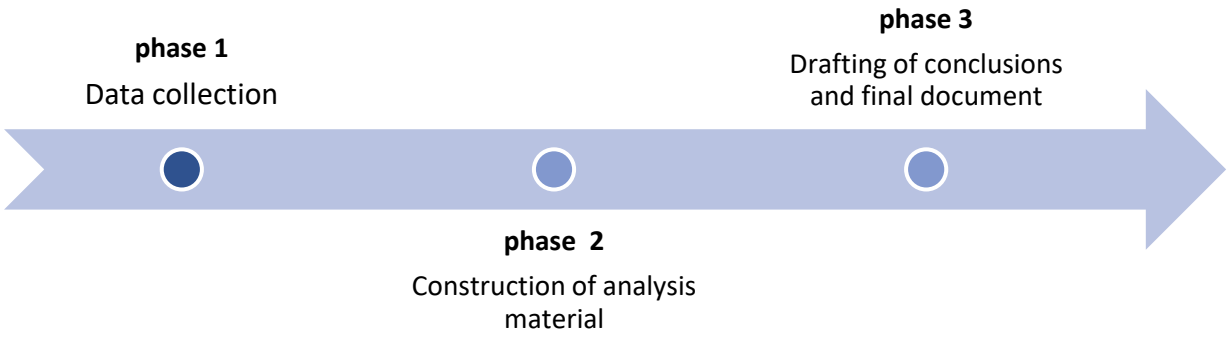

***Figure 1**. Methodological design*
Source: Authors' own creation

3.1.1 Phase 1: Data Gathering

Data collection was carried out from the Search tool on the Scopus website, where 81 publications were obtained from the choice of the following filters:

TITLE-ABS-KEY (ict, AND pedagogy, AND education) AND PUBYEAR > 2017 AND PUBYEAR < 2024

- Published documents whose study variables are related to the study of ICT, Pedagogy and Education
- Limited to the years 2018-2023.
- Without distinction of country of origin.
- Without distinction of area of knowledge.
- Without distinction of type of publication.

3.1.2 Phase 2: Construction of analysis material

The information collected in Scopus during the previous phase is organized and then classified by graphs, figures and tables as follows:

- Co-occurrence of words.
- Year of publication.
- Country of origin of the publication.
- Area of knowledge.
- Type of publication.

3.1.3 Phase 3: Drafting of the conclusions and final document

In this phase, the analysis of the results previously yielded is carried out, resulting in the determination of conclusions and, consequently, the obtaining of the final document.

4. RESULTS

Initially, the lesson plans of the DTI subject practitioners were stored in a drive. Next, a search and systematization of the ICT tools that had been used to motivate, explain and develop the topics in the area of T&I was carried out. The tools were categorized as evidenced in tables 1 and 2, according to their functionality, among them emerged: forms and surveys, educational platforms, evaluation platforms, quizz, photo editors, video editors, digital books and magazines, mind maps, concept maps, histograms, elaboration of comics, stories, or narratives, timelines, 3D modeling, design of digital resources in mobile apps, simulators, multimedia presentations and converters. It should be noted that it is important for the reader to refer to the selection of interactive and simple tools that were used in the DTI practices, listed below.

ICT TOOLS WITH FREE ACCESS			
Category	**Tool**	**Description**	**Link**
Questionnaires and forms	Cerebriti	It is a Platform with which we can generate different types of Tests, a carousel of questions focused on learning; being of great help to initiate, review and reinforce content.	/www.cerebriti.com/
	Google Forms	It is a tool that allows you to create forms (exams - surveys) in an easier way as well as to collect statistics, information and data; Ideal for evaluating classes.	https://docs.google.com/forms/u/0/
	Kahoot	It is a tool that allows you to prepare tests (surveys, exams), perhaps oriented towards learning; it also helps to start, review and reinforce a class to motivate teaching to our students.	https://play.kahoot.it/v2/
	Pear Deck	It is a tool that allows interaction between the teacher and the student through questions and exercises.	www.peardeck.com/googleslides
	Quizizz	It is an application that allows you to create questionnaires in a cooperative, creative, evaluative way and encourages gamification; allowing good learning.	https://quizizz.com/join
	Quizlet	It is a practical tool that allows the organization of a class in a more practical and creative way with games and tests, which allows autonomous learning.	https://quizlet.com/latest
Educational platforms	Class room	It is a tool that unites teaching and learning; manage, create classes, assign assignments, and deliver grades for each student.	https://classroom.google.com/u/0/h?hl=es
	EDmodo	It is a platform that manages classes, shares content and offers resources, in turn there is an interaction between several users, allowing collaborative learning.	https://new.edmodo.com/

	Edu 2.0	It is a platform that generates an environment for learning and teaching. We will also find digital resources that will help guide learning.	www.edu20.org
	Educa Play	It is a platform that creates educational, creative activities; allowing learning to be didactic. We will find activities such as: crossword puzzles, word searches, riddles, dictations, among others.	https://es.educaplay.com/
	Microsoft Teams	It is a tool that generates teamwork, file sharing and workflows are made.	www.microsoft.com/es-co/microsoft-teams/log-in
	Moodle	It is a platform that creates learning environments, generates information and allows tasks to be carried out.	https://moodle.org/?lang=es
	Schoology	It is a platform that allows the creation of educational material.	www.schoology.com/
	Tiching	This platform helps organize educational resources, allowing students to complete tasks at their own pace.	http://co.tiching.com/
	Twiducate	It is a useful platform for teachers, which creates private classrooms, to discuss topics of interest.	www.livelingua.com/twiducate/
	Gocorn	It is a tool that creates educational content, with various educational exercises.	www.goconqr.com/es
	MilAulas	It is a tool that generates learning rooms with free Moodle hosting.	www.milaulas.com/
	Wordwall	It is a simple but very creative tool that offers help to teachers to create their educational resources and even games.	https://wordwall.net/es
	Go Conquer	It is a platform for the creation of mind maps which can be shared and published.	www.goconqr.com/es

Mental and conceptual maps.	Mindmeister	It is a tool that creates online mind maps, in turn allows you to develop and share work.	www.mindmeister.com/es
	Look	It is a program that allows you to make mental, synoptic and conceptual maps individually or in groups.	https://miro.com/app/dashboard/
	Pandlet	It is a tool that creates concept maps, timelines, mind maps.	https://padlet.com/?ref=embed
	Creately	It is a tool that creates conceptual maps, mental maps and timelines.	https://creately.com/es/lp/mapa-conceptual-online/
	CmapTools	It is an easy-to-use program, with which we can create concept maps. although it is not freely accessible.	https://cmap.ihmc.us/cmaptools/
Video	Powtoon	This website generates interactive, creative and innovative videos; that we can use in animated projects and presentations.	www.powtoon.com
	VideoScribe	It is a software that allows the creation of 2D video and animations. Needs a license to work properly after 7 days	www.videoscribe.co
	Clideo	This page allows us to edit video and audio; considering that it has innovative options such as: compression, fusion, cuts, cuts, and speed control.	www.clideo.com
	YouTube	It is a website that allows us to watch and upload videos online, you will find several educational videos.	www.youtube.com
	Animoto	It is a website that allows the creation of video presentations with easy-to-use tools.	www.animoto.com
	Viva Video	This app creates and edits videos for Android devices.	play.google.com/store/apps/details?id=com.quvideo.xiaoying
	Wondershare Filmora	It is a software in which video is created, with a wide variety of tools. it also requires a license.	filmora.wondershare.es

	Prezi Video	Website that creates interactive videos alongside presentations, with sharing and streaming options.	blog.prezi.com/es/presentamos-prezi-video/
	Wondershare UniConverter	Software that allows you to convert and edit videos with a variety of tools.	videoconverter.wondershare.net
	Moovly	With this platform we can create engaging videos to encourage learning. This platform is affordable, intuitive, and simple.	www.moovly.com
	Animaker	Tool that allows you to create and edit videos in a simpler way since it offers its own photographs, text and audio.	www.animaker.es/
	Vimeo	It is a platform for uploading video where quality is the most important thing.	https://vimeo.com/es
	SnapTube	This tool allows you to download videos and music.	www.snaptubeapp.com/
Converters	Ilovepdf	Platform that allows us to convert documents to pdf easily.	www.ilovepdf.com/es/pdf_a_word
	smallpdf	It is a software that allows you to convert and manage documents to pdf and vice versa.	https://smallpdf.com/es/convertidor-pdf
	Online Converter	It's a page that converts any image, video, text, or audio format.	www.online-convert.com/es
	Snap	It is a tool that converts video to mp3, in addition to being very fast in its downloads, it is very attractive to the view of users.	www.online-convert.com/es
	Online Audio Converter	Fast website, as well as supporting any file where audios are converted instantly.	https://online-audio-converter.com/es/
	PDF24 Tools	Application that has several important functions such as: converting documents and images to pdf.	https://tools.pdf24.org/es/
	Converter 365	Document converter that you can use online. Convert more than 1000 different formats.	www.converter365.com
	AnyCon	Online tool that converts documents, audio, video, image; It can be used in a	https://anyconv.com/es/

		different way.	
	DOCUPUB	This website serves as a Document to Image Converter.	https://docupub.com/pdfconvert/
	Soda PDF online	Website Text File to PDF Converter in turn creates and edits.	www.sodapdf.com/es/txt-para-pdf/
	HTML to PDF	Website as an html to pdf converter, you can use it with the Url and dragging the file.	www.htmlapdf.com
	Stocking	This service converts audio to any other file while being easy to use.	www.media.io/es/
	Pdf candy	It is a free online service that fulfills its function as a pdf to Word converter, join pdf.	https://pdfcandy.com/es/
	Atube Catcher	Software that allows you to download video especially from Youtube in turn is video and audio converter.	https://www.atube.me/es/
	Doc downloader	Platform that makes it possible to download SCRIBD documents.	https://docdownloader.com/
Image	Iloveimg	It is a Web platform that fulfills the function of a photo editor.	https://www.iloveimg.com/es/editor-de-fotos
	PhotoFancy	It is an easy-to-use online photo editor, tasks and image editing platform, .	https://www.photofancy.es/funciones/editor-de-fotos-
	Pixlr	Image editor.	https://pixlr.com/es/x/
	Believed	Photo editing for social networks.	https://crello.com/es/pro/design
	Picsart	It is an application that works as a photo editor, collages, drawing and social network; an Instagram-style social network, with its likes, tags, comments and followers.	https://play.google.com/store/apps/details?id=com.pics
	Photopea	It is a web application that allows you to create and function as a photo editor. Finally , Photopeach supports .psd, .xd, .sketch, .xcf, RAW files, and compressed formats such as JPG, PNG, and more.	https://www.photopea.com/
	Adobe Lightroom	It is a Photo Editing and Organizer app; There we can organize, edit and share our	https://www.adobe.com/co/products/photoshop-lightroom.html

		photographs through a computer, smartphone or tablet.	
	Photor editor	Tool that allows cropping images in JPG format, PNG, works as an image editor.	https://www.fotor.com/photo-editor-app/editor/basic
	Sticker.ly	You can create your own sticker packs for Whatsapp and it works as a photo editor for your gallery.	https://play.google.com/store/apps/details?id=com.sno
	Waifu 2x	This application allows you to increase the resolution of images.	http://waifu2x.udp.jp/index.es.html
	befunky	Photo editing platform, collage creation, and its graphic design workflow tools and features for editing photos, creating collages, and doing graphic design. Here are some favorites: Photo editing.	https://www.befunky.com/es/opciones/editor-de-fotos/
Digital books and magazines	Calaméo	It is a tool that allows you to create, host and share interactive publications, as well as convert documents (PDf, word, powerpoint) to be able to read them later as a digital magazine	https://es.calameo.com/
	Reedsy Blog	It is a blog that allows the creation of books, as well as daily giving advice and ideas for writing.	https://reedsy.com/
Mobile apps	VITA	It is a high-quality and easy-to-use mobile video editor tool.	https://play.google.com/store/apps/details?id=com.sno
	CapCut	It is an application in which you can edit videos for mobiles such as android and ios, but also for PC.	https://www.capcut.net/
	QUIK	Application that works as a video editor for mobiles.	https://play.google.com/store/apps/details?id=com.gopro.smarty&hl=es_CO&gl=US
	VideoShow	Video editor for mobiles which are going to be created from images and videos, something to highlight is that you can add subtitles, this would be ideal for classes.	https://play.google.com/store/apps/details?id=com.xvideostudio.videoeditor&hl=es_CO&gl=US

	You Cut	Mobile video editor for an Android operating system.	https://play.google.com/store/apps/details?id=com.camerasideas.trimmer&hl=en&gl=US
	Inshot	Video editor for Android and ios mobiles, with which we can crop, edit, give better definition; at the same time give an innovative style to what is created.	https://play.google.com/store/apps/details?id=com.camerasideas.instashot&hl=es_CO&gl=US
	APPHIVE	Programming applications without the need to write code, the created application is worked on in a dynamic and easy way, so that the result is seen in minutes.	https://apphive.io/es
	ANDROID STUDIO	Development of applications for android, ideal for students to learn to program in an easier way.	https://developer.android.com/studio
	Grasshopper	A tool to write Java code from scratch, promoting the democratization of programming learning that was not previously accessible to everyone.	https://grasshopper.app/es_419/
Multimedia presentations	Prezi	Application to create narrative presentations, through canvas, in a more creative way, allowing the exchange of ideas.	https://prezi.com/
	Emaze	It is an application to create interactive presentations with 3D designs; to carry out tasks, final projects, final presentations.	https://www.emaze.com/es/
	Mentimeter	Digital resource that allows us to create presentations; promoting the participation of students in a subject or a course.	https://www.mentimeter.com/es-ES
	Genially	It is a tool that allows us to create interactive content and create presentations, as well as infographics or maps.	https://genial.ly/es/
	Canva	Web design to create interactive presentations, ideal for handing in class work, to explain a topic, in a more colorful and creative way.	https://www.canva.com/es_co/crear/presentaciones/

	Visme	Online tool that creates interactive presentations, infographics, videos.	https://www.visme.co/es/
	Piktochart	Tool for creating interactive presentations and infographics.	https://piktochart.com/
Audio	Audacity	The most complete program to record and edit audios is free to use, so it will be a key tool when it comes to making final projects.	https://audacity.uptodown.com/windows
	Power	Tool to publish podcasts, have statistics, personal site, blog and ratings.	http://www.poderato.com/
	Bridges to the World	School radio that allows to disseminate topics related to education and society.	http://puentesalmundo.net/
	Ivoox	It is a platform that can produce, download, and share podcasts, radio shows, audiobooks, audio series, among others.	http://www.ivoox.com/
	Radio Library	It is a platform where you can download audios, share productions with other radio stations and also find training resources.	http://radioteca.net/
	Podomatic	It is a platform that allows you to create and share podcasts, you can also attach audio (mp3, ogg, wav).	http://www.podomatic.com/directory/K-12
	Kid Cast	Podcast creation.	http://kid-cast.com/
	Podcast Alley	It is a platform where various podcasts are linked and categorized, you can also find podcast news articles.	http://www.podcastalley.com/
	Eduteka	This platform includes web 2.0 applications for creating and editing audio files.	http://eduteka.icesi.edu.co/articulos/Audio
	Spotify	Platform for playing music and listening to podcasts.	https://www.spotify.com/co/
	Idiot	Platform to record audio and also edit, cut audio, convert audio, and change songs.	https://vocaroo.com/
	Audioboom	Software to record, publish, and share audio files and publish them to the cloud.	https://audioboom.com/
	Rev	Ideal tool for recording, editing and exporting audio.	https://www.rev.com/voicerecorder
	Spreaker	It is a platform to record and create podcasting, in turn	https://www.spreaker.com/

		store the audios; so that they can then be monetized.	
	Soundcloud	Online audio distribution platform; Share them privately or publicly with friends, blogs, sites, and all your social networks.	https://play.google.com/store/apps/details?id=com.soundcloud.android&hl=es_CO&gl=US
	123apps	Web tool for converting, cutting, joining, and recording voice; also to combine songs.	https://123apps.com/es/
	Hya-Wave	Tool like editing, cutting, pasting, mixing, and adding audio effects.	https://wav.hya.io/#/fx
	Adobe Audition CC	Applications record, edit and create audio, in turn allow you to watch step-by-step tutorials and download.	https://www.adobe.com/es/products/audition.html
	Apowersoft	Tool for recording audio, performing functions such as: create, mix, and design.	https://www.apowersoft.com/streaming-audio-
	AudioDirector 9	A tool to record and give effects to audio files, ideal for making audios or teaching a topic.	https://es.cyberlink.com/products/audiodirector/features_es_ES.html
	Clideo	Platform for editing audio, making gifs, and editing images.	https://clideo.com/es/merge-audio
	Anchor	Platform to record podcasts, share podcasts to grow the audience, in turn we can edit and create them from scratch.	https://anchor.fm/
	BandLab	Platform to create, share and configure audios.	https://www.bandlab.com/?lang=es
Comics, stories, narratives	Storybird	a tool that is used for the creation of tales and stories.	https://storybird.com/
	Tikatok	Tools to make stories or digital books.	http://recursostic.educacion.es/blogs/malted/index.php/2012/03/20/tikatok
	Mystorybook	A tool for telling stories, in turn we can add images, scenarios and texts.	h,ttps://www.mystorybook.com/
	Pixton	Comic Book Creation	https://www-es.pixton.com/
	Story Jumper	Comic Book Creation	https://www.storyjumper.com/

	Byond	Creating comics and animations	http://www.byond.com/
	Make Beliefs Comix	Tool to create, design, edit, and publish comics in different pre-designed templates.	https://makebeliefscomix.com/
Timelines	Adobe spark	Tool to create timelines with non-copyrighted images.	https://www.filehorse.com/es/descargar-adobe-spark/
	Lucidchart	Timeline generator tool, select the variety of layouts found there.	www.lucidchart.com
	Timeline JS	Free tool to create a timeline, in a flexible and friendly way.	https://timeline.knightlab.com/
	Timeline 3D de Bee Docs	Tool to create timelines in three dimensions, you can use it on mobile devices with Mac OS X operating system.	https://pcmacstore.com/es/app/929188617/timeline-3d
	Timetoast	It is an application in which we can create and publish timelines.	www.timetoast.com/
	Padlet	Tool to make timelines, mind and conceptual maps	padlet.com/?ref=embed
3D Modeling	Tinkercad	Software to design, model and print 3D designs.	www.tinkercad.com
	Blender	The tool is used to work on the creation of 3D modeling, digital painting, 3D animation, digital sculpture, 3D printing, comics, 2D animation and video editing.	www.blender.org/
Simulators	Tinkercad	It is an application to simulate electrical circuits and 3D models.	www.tinkercad.com
	Cisco Packet tracer	It is a comprehensive teaching and learning tool allowing students to simulate networks.	www.netacad.com/es/courses/packet-tracer
	Animal 4D+	Animal cards in augmented reality.	https://play.google.com/store/apps/details?id=com.OctagonStudio.Animal4DPlus&hl=es_EC&gl=US
	Augmented Class	Create and develop augmented reality projects.	https://play.google.com/store/apps/details?id=com.AugmentedClass.AClass&hl=es_CO&gl=US
	Crocodile Clips	Tool for simulating electrical circuits.	https://es.ccm.net/descargas/vida-cotidiana/8408-crocodile-clips-para-pc/
	Quiver - 3D Coloring App	It is an application to carry out augmented reality projects, making learning more creative and innovative.	https://quivervision.com/

	kiCad	Electronic diagrams and PCB layouts.	www.kicad.org/
Video Game Tools	PC building	simulator that allows you to learn how to diagnose PC	https://www.epicgames.com/store/es-ES/p/pc-building-simulator
	Mobbyt	Platform for creating educational video games.	https://mobbyt.com
Web Development	Braces	Tool that allows you to edit source code, ideal for creating software, website, video game among others.	https://brackets.io/

Table 1. Categorization of ICT tools with free access.
Note: ICT tools of free access.
Source: Compilation of class planners in the DTI subject 2018 – 2021

ICT PAYMENT TOOLS			
Category	**Tool**	**Description**	**Link**
Platforms Evaluative	QuizBean	Tool for the development of interactive questionnaires	http://quizbean.com/
	Socrative	Application: create questionnaires by making teachers motivate students to participate in the classroom.	https://www.socrative.com/
	Sporcle	Quizzes on a variety of topics using the web or a mobile device	https://www.sporcle.com/
	Easy LMS	Ideal learning platform for creating quizzes (quiz).	https://www.onlinequizcreator.com/es/
	Typeform	Tool to create forms, surveys and questionnaires.	http://typeform.com/
	Poll everywhere	Tool to create surveys, questionnaires anonymously through mobile devices, tablets or computers.	ww-polleverywhere[1]com.translate.goog/?_xtrsl=en&xtrtl=es&xtrhl=es[1]419&xtrpto=nui,sc
	Edpuzzle	A tool that allows the teacher to modify multimedia content to their liking, for example: a very multimodal creative video.	https://edpuzzle.com/
	Mentimeter	Tool in which you can interact and create questionnaires, survey and games.	https://www.mentimeter.com/es-ES
	SurveryKiwi	Tool for interactive forms, also collects information with interactive forms.	
Educational platforms	Suite de Google Drive	Workspace that allows you to meet with work teams, edit documents, exchange emails from a collaborative platform. Integrates tools such as Gmail, Google Calendar, Google Drive, Google Chat, among others	https://app.bluecaribu.com/

	Coursera	Platform to take certified courses among which are: business, history, computer science, physical sciences, languages, arts and humanities, among a wide range of these.	https://es.coursera.org/
	TED-Ed	Tool that allows you to create personalized lessons based on the numerous audiovisual resources included in your web space or create them from scratch from videos on your YouTube channel.	https://ed.ted.com/
	Gocorn	Create educational content that improves student learning with different actions such as: create, share and discover; mind maps, study cards, online notes.	https://www.goconqr.com/es
	MilAulas	Platform to create learning rooms with free Moodle hosting.	https://www.milaulas.com/
	Blackboard	E-learning tool, it is a virtual environment that gives the opportunity to study from home, therefore it is especially for teachers and students.	https://www.blackboard.com/es-lac
Mind and concept maps	Lucidchart	It is a diagramming platform for making conceptual and mental maps and histograms.	https://www.lucidchart.com/pages/es
	MindMaps	Graphic tool for creating mind and concept maps online. This tool will enhance creativity and achieve clearer thinking.	https://www.mindmaps.app/
Video	Powtoon	Online platform that allows the creation of animations with a fun and intuitive approach; It is very useful to capture the attention of the audience and to develop the explanation of a concept.	http://www.powtoon.com/
	VideoScribe	Creation of 2D video and animations.	http://www.videoscribe.co/
	Scribely	Cloud video creation software for content creation. The software offers users features such as video maker, resume maker, GIF maker, among others.	http://www.scribely.co/
	Animoto	Tool for video and presentation creation; allows you to create educational videos, animated in an objective - practical way	http://www.animoto.com/
	Wondershar and Filmora	Tool for editing and creating videos; It is ideal for YouTube or for generating content for social networks.	filmora.wondershare.es
	Moovly	The tool allows you to make animated, original and creative presentations. Its conception is to make the presentation or a video of impact.	https://www.moovly.com/
	smallpdf	Software to convert documents to pdf and vice versa, ideal for delivering innovative work	https://smallpdf.com/es/convertidor-pdf

Converters	Soda PDF online	Ideal software for converting, creating, editing and signing text files to pdf, it is ideal as a tool in some activity or delivery of a work.	https://www.sodapdf.com/es/txt-para-pdf/
Image	Picmonkey	Image editing tool; to make collage, crop the photographs and adjust color; ideal for students to carry out tasks in a more innovative way.	https://www.picmonkey.com/es/editor-de-fotos
	Photoshop	Image editing tool, in turn you could create new images; Ideal for encouraging creativity in any population.	https://www.adobe.com/es/creativecloud.html#mini-plans-web-cta-photoshop-card
Digital books and magazines	Joomag	Comprehensive innovative platform for the creation of digital magazines, ideal for everyone, even those who guide an activity because they can be autonomous from their own content	https://www.joomag.com/
Multimedia presentations	Prezi	Tool that allows you to create presentations without following an order, as well as allowing the exchange of ideas; This is an ideal tool for guiding a class by attracting the attention of students	https://prezi.com/
	Mentimeter	Web application to create presentations with interaction with the audience.	https://www.mentimeter.com/es-ES
	Visme	Tool to create interactive presentations, infographics, videos in a more dynamic way.	https://www.visme.co/es/
Comics, stories, narratives	Storybird	Tool for creating online stories encouraging creativity.	https://storybird.com/
	Mystorybook	Digital resource to create and narrate simple stories giving the possibility of adding images, text, scenarios.	https://www.mystorybook.com/
	Pixton	Web tool for creating comics using figures, scenes, and characters.	https://www-es.pixton.com/
	Story Jumper	Tool for the creation of comics that can be published.	https://www.storyjumper.com/
	Byond	Application for the creation of comics and animations; by connecting to the cooperative network.	http://www.byond.com/
	Make Beliefs Comix	Website to create, edit and publish comics, you can create them from scratch or use designs already proposed on the website	https://makebeliefscomix.com/
	Adobe spark	Interactive platform: timelines are created with text and images that you can then share on the platform so that you can	https://www.filehorse.com/es/descargar-adobe-spark/

Timelines	LUCIDCHART	Software to capture and collaborate on different jobs and to create timelines	https://www.lucidchart.com/
	Padlet	Online tool that allows you to create timelines, mental and conceptual maps	https://padlet.com/?ref=embed
3D Modeling	Autocad	Software for designing, modeling, and drawing in 2D and 3D modeling.	https://latinoamerica.autodesk.com/products/autocad/overview
Simulators	Augmented Class	App (application) allows you to create, develop and visualize augmented reality projects, in an easy way.	https://play.google.com/store/apps/details?id=com.AugmentedClass.AClass&hl=es_CO&gl=US

Table 2. Categorization of paid ICT tools.
Note: Paid ICT tools.
Source: DTI Glider Compilation 2018 - 2021

4.1 Word co-occurrence

Figure 2 shows the co-occurrence of keywords found in the publications identified in the Scopus database.

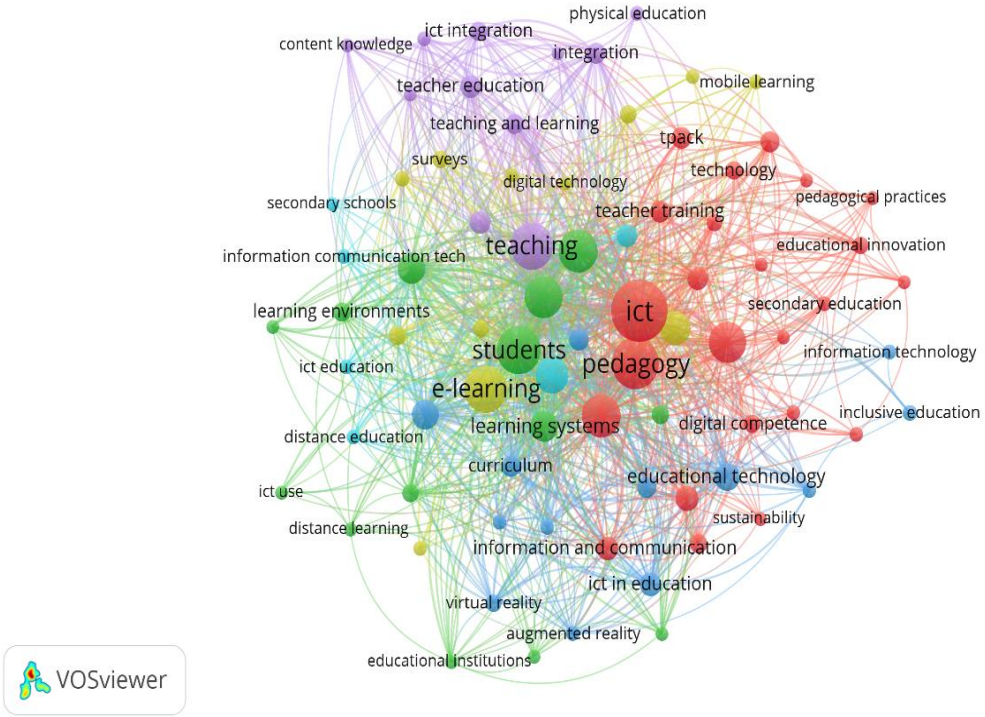

***Figure 2**. Word co-occurrence*
Source: Own elaboration (2024); based on data exported from Scopus.

Pedagogy was the keyword most frequently used within the studies identified through the execution of Phase 1 of the Methodological Design proposed for the development of this article. Education is among the most frequently used variables, associated with variables such as Adolescents, Youth, ICT, Learning Systems, Technological Education, Digital Component, Teachers. From the above, it is striking that the use of ICT tools has become an increasingly indispensable element for educational

environments. It is worth mentioning that the use of these technological tools in teaching processes should be considered as an educational strategy, therefore, it is necessary for educators to be trained and at the forefront of these resources in order to improve their pedagogical practices and thus improve the quality of learning among students. These technologies would open new doors to a globalized world, establish new educational paradigms and promote digitalized and quality education.

4.2 Distribution of scientific production by year of publication

Figure 3 shows how scientific production is distributed according to the year of publication.

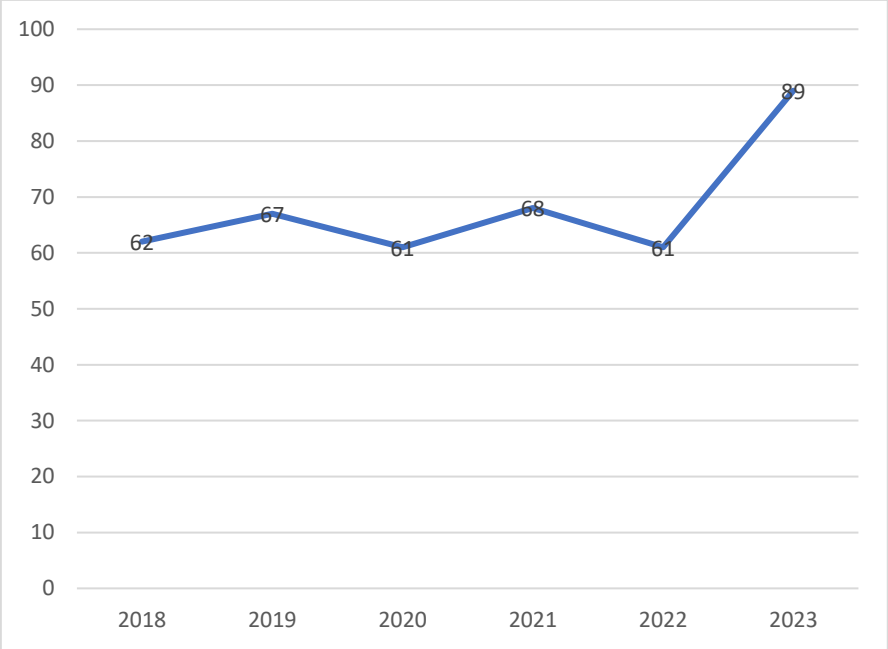

***Figure 3**. Distribution of scientific production by year of publication.*
Source: Own elaboration (2024); based on data exported from Scopus

Among the main characteristics evidenced by the distribution of scientific production by year of publication, an increase in the number of publications registered in Scopus during the years 2023 is notorious, reaching a total of 89 documents published in journals indexed on this platform. This can be explained thanks to articles such as the one entitled "Post-pandemic pedagogy: impact of emergency remote teaching on students with functional diversity" The objective of this study was to investigate (i) parents' opinions about students with functional diversity regarding ERT during the Covid-19 pandemic and (ii) how their children's functional diversity affected participation in ERT. ERT turned out to be an even greater challenge for those students, who faced various learning, psychological and technical problems that further hindered the learning process. In the present research, the opinions of 12 parents of students with functional diversity were collected through semi-structured interviews. A modern Greek dataset of qualitative humanistic-linguistic data was created. A new type of data analysis was carried out in the text of the interview, which combines a manual qualitative descriptive analysis and a linguistic analysis based on Artificial Intelligence (AI). The results revealed (i) how those students responded to ERT, (ii) how their functional diversity affected their attendance at online courses, and (iii) how their parents assess the educational dimension of ERT along with any observed changes in their children's psychological health. and emotional state. Parent assessments revealed the overall negative impact of ERT on their children and presented their suggestions for meeting their child's special needs should ERT be used in the future(Tzimiris, 2023)

4.3 Distribution of scientific production by country of origin

Figure 4 shows how scientific production is distributed according to the country of origin of the institutions to which the authors are affiliated.

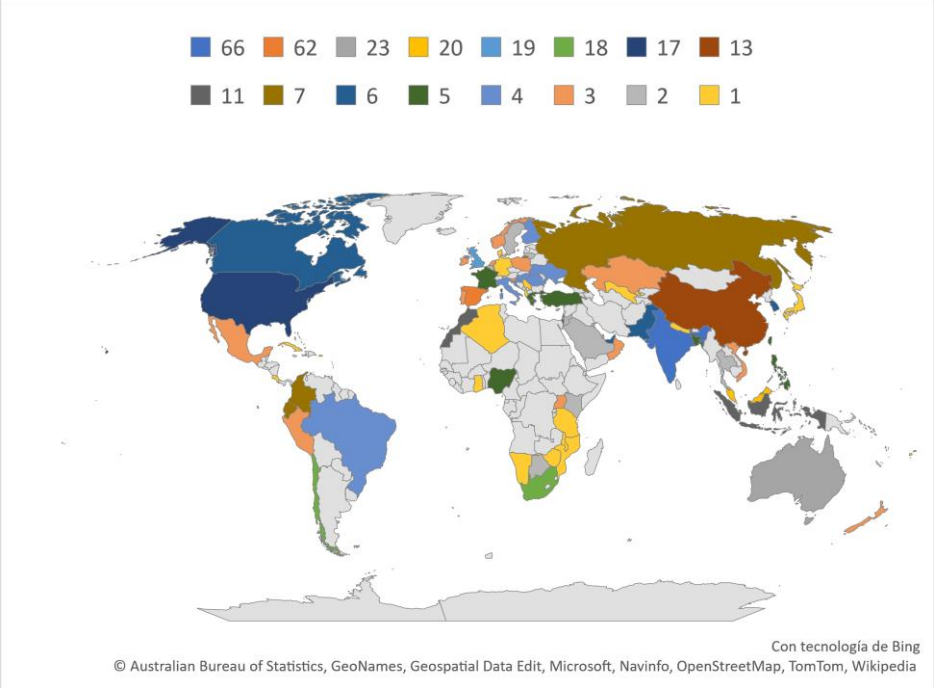

***Figure 4**. Distribution of scientific production by country of origin.*
Source: Own elaboration (2023); based on data provided by Scopus.

Within the distribution of scientific production by country of origin, records from institutions were taken into account, establishing India as the country of that community, with the highest number of publications indexed in Scopus during the period 2018-2023, with a total of 66 publications in total. In second place, Spain with 62 scientific papers, and Australia occupying third place presenting to the scientific community, with a total of 23 papers among which is the article entitled "Exploring the TPACK of future nursing educators: a national study" The purpose of this study is to measure the knowledge of the self-reported technological pedagogical content (TPACK) of 82 future nursing educators in Morocco. A cross-sectional design was adapted using a questionnaire based on TPACK. The results reveal that participants had adequate self-perceptions of their TPACK, with higher scores in Pedagogical and Content Knowledge and lower scores in Technological Content Knowledge. The study recommends increased teacher training to help nurse educators integrate technology, pedagogy, and content into their teaching practices.(Ait Ali, 2023)

4.4 Distribution of scientific production by area of knowledge

Figure 5 shows the distribution of the preparation of scientific publications based on the area of knowledge through which the different research methodologies are implemented.

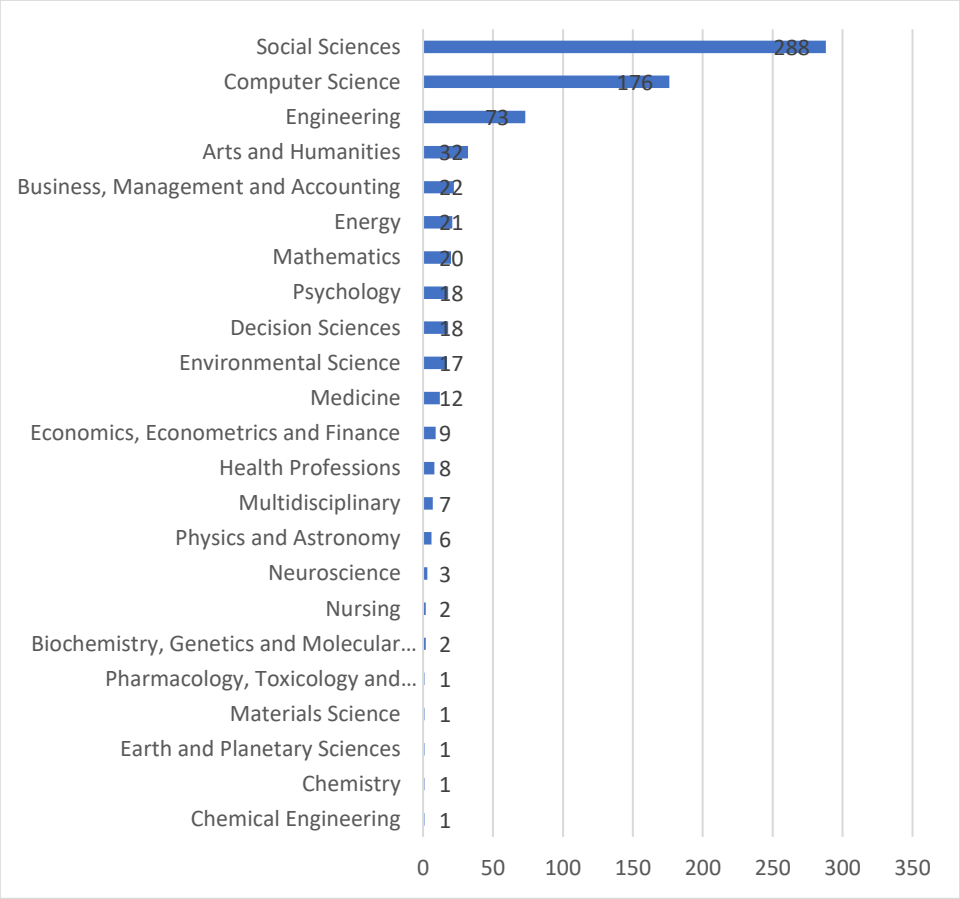

***Figure 5**. Distribution of scientific production by area of knowledge.*
Source: Own elaboration (2023); based on data provided by Scopus

Social Sciences was the area of knowledge with the highest number of publications registered in Scopus with a total of 288 documents that have based its methodologies ICT, Pedagogy and Education. In second place, Computer Science with 176 articles and Engineering in third place with 73. The above can be explained thanks to the contribution and study of different branches, the article with the greatest impact was recorded by Social Sciences entitled "Decoding of contextual factors that differentiate the high, average and low digital reading performance of adolescents using machine learning methods" The article aims to identify key contextual factors that synergistically differentiate high and low performers, to high and medium throughput, and to low and medium throughput in digital reading, through the use of machine learning methods, namely support vector machine (SVM) and recursive SVM. Feature removal. In addition, Shapley's Additive Explanations (SHAP) method was applied to augment machine learning models and detect the impact of features on the final result. Reading data from the latest Programme for International Student Assessment were analysed and the samples included 276,269 15-year-old students from 38 countries of the Organisation for Economic Co-operation and Development. The results show that an optimal set of contextual factor characteristics at the school, classroom, and student levels in the high-low model, the high average model, and the low average model have high accuracy. Compared to medium-achieving students, high-achieving students spend more time reading emails and are associated with high-quality teaching that incorporates digital literacy, and low-achieving students are characterized by a lack of interest in the use of ICT and are more susceptible to abuse of ICT resources. disorder in the classroom and discrimination at school. Using machine learning algorithms for peer comparisons provides new insights for personalized digital reading education, and evaluating the effect of each factor using the SHAP method offers clear insight for educational researchers.(Hu, 2023)

4.5 Type of publication

In the following graph, you will see the distribution of the bibliographic find according to the type of publication made by each of the authors found in Scopus.

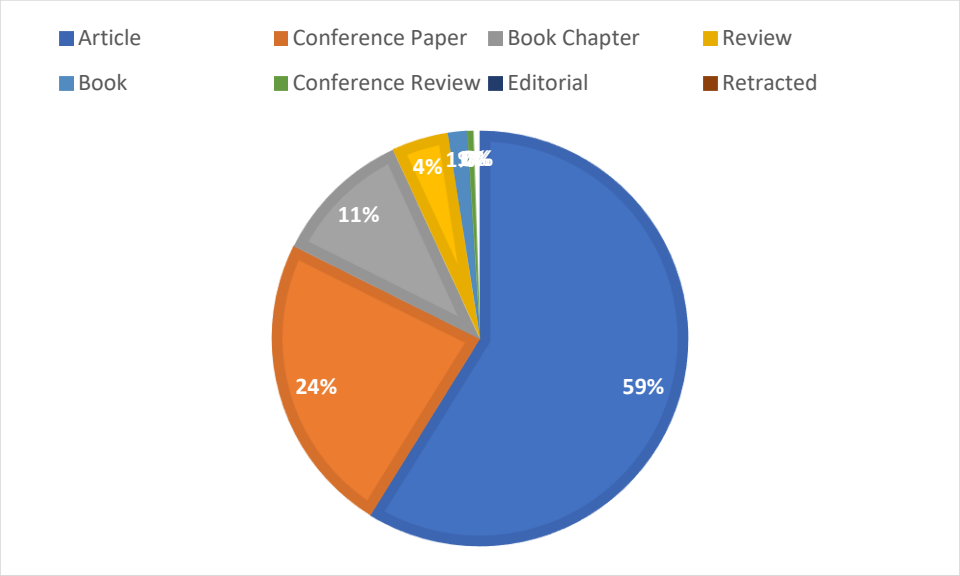

***Figure 6**. Type of publication.*
Source: Own elaboration (2023); based on data provided by Scopus.

The type of publication most frequently used by the researchers referenced in the body of this document was entitled Journal Article with 59% of the total production identified for analysis, followed by Session Paper with 24%. Book Chapter are part of this classification, representing 11% of the research papers published during the period 2018-2023, in journals indexed in Scopus. In this last category, the one entitled "Computer self-efficacy and integration of ICT in education: structural relationship and mediating effects" stands out. This study explores the association between computer self-efficacy (basic technological skills, advanced technological skills and technology for pedagogy) and the intentions of future teachers to use technology (traditional use of technology and constructivist use of technology). Data collected from 267 Bahrain Teachers College students were used to validate the questionnaires using confirmatory factor analysis. The structural equation modeling approach was used to explore hypothetical relationships. A mediation analysis was also carried out and the results indicated that basic technological skills and advanced technological skills mediated the relationship between technology for pedagogy and the traditional use of technology. Advanced technological skills did not mediate the relationship between technology for pedagogy and constructivist use of technology.(Afari, 2023)

5. CONCLUSIONS

After the analysis of this research and from the experience in micro practices in the subject of DTI of the UPTC, it is evident that the tools categorized in Tables 1 and 2 can help to enhance classroom practices of any subject at different levels of education and even higher education.

Thanks to all of the above, we can interpret that ICT tools are here to stay in the educational field. This article aims to provide a catalog of categorized tools to be implemented in the lesson plan at different times, motivation, exploration, diagnosis, explanation, practice and evaluation.

Through the bibliometric analysis carried out in this research work, it was possible to establish that the United Kingdom was the country with the highest number of records published for the variables ICT, Pedagogy and Education. With a total of 66 publications in the Scopus database. In the same way, it was possible to establish that the application of theories framed in the area of Social Sciences, the results of the previous bibliometric analysis can be concluded that ICT, as a technological tool, has significantly increased the teaching and learning processes in education, since this innovative

tool has allowed the creation of new models of communication, in addition to the creation of new training spaces, which stimulate learning in students, breaking the paradigmatic barriers of traditional classrooms, since this resource in education adopts the creation of more motivating and challenging educational environments when acquiring knowledge. This fact can be used as a fundamental tool for education agents. The use of ICT in the teaching and learning processes in the classroom requires a number of competencies in which teachers must acquire new methodologies where they seek to take advantage of these technological resources, teachers must be the pillar when facing new educational challenges. With this technological resource, teachers can improve the quality of teaching, while being able to provide the opportunity to take advantage of their students' free time and their learning in a more optimal way and to be able to address the individual needs that each student requires. This resource would allow learning outside the traditional classrooms, breaking down barriers to education, academic flexibility and establishing an autonomous learning model. It is a fact to consider that the contribution of ICT to education emphasizes flexibility and adaptability in increasingly changing environments, which is why the participation of ICT as tools to pedagogical models can become a powerful ally for learning processes, managing to promote students with ideal personal and professional skills in a constantly changing world.

Finally, this work aims to persuade future research that manages to find methodologies, techniques and didactic strategies with pedagogical mediations in ICT to favor the teaching work.

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