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Índice

- 1.- Efectos de la realidad aumentada y virtual en estudiantes con TEA // Effects of augmented and virtual reality on students with ASD** **7**
Jesús López-Belmonte, Pablo Dúo-Terrón, Antonio-José Moreno-Guerrero, José-Antonio Marín-Marín
- 2.- Robots sociales, música y movimiento: percepciones de las personas mayores sobre el robot Pepper para su formación// Social robots, music and movement: Older people's perceptions of the Pepper training robot** **25**
Rosabel Martínez-Roig
- 3.- Prevalencia del uso problemático de Internet y factores asociados en estudiantes universitarios hondureños // Prevalence of problematic Internet use and factors associated among honduran university students.** **43**
Isabel Martínez-Álvarez, Sergio Hidalgo-Fuentes, Fátima Llamas-Salguero, Iris Suyapa Pineda-Zelaya
- 4.- Validación de contenido de una escala sobre actitudes hacia la programación y el pensamiento computacional en docentes de Primaria a partir del método Delphi // Validation of content of a scale on attitudes towards programming and computational thinking in primary school teachers using the Delphi method.** **61**
Ana González-Cervera, Olga Martín-Carrasquilla, Yolanda González-Arechavala
- 5.- Implementing the Power of Blended Learning in the Era of AI War in Indonesia // Implementación del poder del Blended Learning en la era de la guerra de la IA en Indonesia.** **77**
Muhamad Jhoni, Muhamad Fauzi, Maslinawati Mohammad, Faizatul Mabruroh, Fitri Oviyanti
- 6.- Análisis del uso de la inteligencia artificial en la educación universitaria: una revisión sistemática// Analysis of the use of artificial intelligence in university education: a systematic review.** **97**
Óscar López-Regalado, Nemecio Núñez-Rojas, Óscar Rafael López-Gil, José Sánchez-Rodríguez
- 7.- Perfil Competencial del Profesorado Andaluz en Seguridad Digital: Evaluación de la Protección de Datos y Privacidad de acuerdo con el Marco de Competencias Digitales para la Ciudadanía (DigComp 2.2) // Competency Profile of Andalusian Teachers in Digital Security: Evaluation of Data Protection and Privacy in accordance with the Digital Competencies Framework for Citizenship (DigComp 2.2).** **123**
Rafael Villén-Contreras, Miriam Agreda-Montoro, Javier Rodríguez-Moreno
- 8.- Análisis de vídeo-annotaciones sobre el uso de recursos tecnológicos durante el Prácticum // Analysis of video-annotations on the use of technological resources during the Practicum** **143**
Olalla García-Fuentes, Manuela Raposo- Rivas, María-Esther Martínez-Figueira, José Antonio Sarmiento-Campos
- 9.- Efecto de la enseñanza virtual sobre el rendimiento académico universitario: Un análisis de regresiones de Difference in Difference // Effect of virtual teaching on university academic performance: A Difference in Difference regression análisis.** **145**
Ignacio Romero-Cruz
- 10.- Millennials vs Centennials: ¿diferentes formas de aprender? // Millennials vs Centennials: Different Ways of Learning?.** **163**
Anna Sánchez-Caballé, José Cela-Ranilla, Francesc Esteve-Mon

Millennials vs Centennials: Different Ways of Learning?

Millennials vs Centennials: ¿diferentes formas de aprender?



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ABSTRACT

The present work constitutes a thorough comparative analysis focused on the learning patterns adopted by two distinct generations of students: Millennials and Centennials. The concept of "learning patterns" centers around the organization that individuals employ to access knowledge and address both academic and everyday tasks. The research involved the participation of 315 university students in the field of education, who underwent analysis using the non-parametric U Mann-Whitney test.

The obtained results reveal significant differences between both generations. Specifically, Millennials show a greater inclination towards the search and possession of detailed information, contrasting with Centennials, who statistically present higher values when using patterns associated with autonomous work. This disparity suggests that over the past fifteen years, students have forged different learning approaches, likely influenced by various factors such as technological advances, changes in the educational model, and situations arising from the pandemic.

This phenomenon raises the pressing need to reflect on the social reality experienced in recent years and how teaching practices must adapt to these changes. This study contributes to understanding these changes and provides a solid foundation for pedagogical decision-making in the current context.

RESUMEN

Este trabajo constituye un análisis comparativo enfocado en los patrones de aprendizaje adoptados por dos generaciones distintas de estudiantes: Millennials y Centennials. La noción de "patrones de aprendizaje" se centra en la organización que las personas emplean para acceder al conocimiento y abordar tanto tareas académicas como cotidianas. En la investigación han participado 315 estudiantes universitarios del ámbito educativo, quienes fueron sometidos a un análisis mediante la prueba U de Mann Whitney.

Los resultados obtenidos revelan diferencias significativas entre ambas generaciones. En particular, los Millennials exhiben una mayor inclinación hacia la búsqueda y posesión de información detallada, contrastando con los Centennials, quienes presentan valores estadísticamente más elevados al emplear patrones asociados al trabajo autónomo. Esta disparidad sugiere que, en los últimos quince años, el estudiantado ha forjado enfoques de aprendizaje distintos, probablemente influenciados por diversos factores, tales como avances tecnológicos, cambios en el modelo educativo y situaciones derivadas de la pandemia.

Este fenómeno plantea la necesidad imperante de reflexionar sobre la realidad social experimentada en estos últimos años y sobre cómo la acción docente debe adaptarse a estos cambios. Este estudio contribuye al entendimiento de estos cambios y brinda una base sólida para la toma de decisiones pedagógicas.

PALABRAS CLAVES · KEYWORDS

Patrones de aprendizaje; Diferencias generacionales; Educación superior; Millennials; Centennials
Learning patterns; Generational differences; Higher education; Millennials; Centennials

1. Introduction

The beginning of the 21st century has been marked by various social changes that have undoubtedly brought about new ways of relating to people, institutions, information, tasks to perform and, in short, new ways of understanding the world around us.

On the one hand, the introduction of digital technologies has the potential to bring about changes in the way information is consumed and, consequently, in learning styles (Lemus-Pool et al., 2020). Similarly, we can assume that the incorporation of Spanish universities into the European Higher Education Area (EHEA) since 2003 has also configured an academic environment in the university that has somehow shaped the profile of the student body (Esteve & Gisbert, 2011). And it is possible that the expectations generated by this change have conditioned the way in which the educational periods preceding higher education are approached.

In addition to the technological advances and the educational changes brought about by the adaptation to the EHEA, one could even include in this description the fact of having gone through a pandemic which, in this case, has conditioned educational processes from the point of view of both teachers and students, and indeed of educational centers in general (Bergan et al., 2021).

During this period, several clearly distinguishable cultural generations have been defined in time, as we will describe in more detail below. The concept of generation can be approached from several perspectives, one of the most widely accepted being that which focuses on the experiences of a group of contemporary individuals. In this sense, a generation can be defined as a collective of people born at a time close to each other, who share experiences, values, communities and thus a partially common identity, and who are shaped by various global events and social trends (Roberts et al., 2012).

Although there is no single definition for the concept of a generation, some authors have defined it by focusing on a period of time (Howe & Strauss, 2008). Specifically, they have stated that it is the sum of people born in a period of about 20 years, which used to be a phase of life, coexisting in the university at the beginning of the century, two generations (Millennials or Generation Y and Centennials or Generation Z) with their different characteristics (Seemiller & Grace, 2016).

Based on this reality, the present research aims to provide specific information on the learning profile of the people who make up these two generations, in terms of the way they organise themselves to access knowledge and the way they approach both academic and everyday tasks. This characterization has taken as its conceptual reference the construct of learning patterns coined and developed by Johnston (1996).

In short, the specific question posed in this paper is whether the two generations referred to present differences in their learning patterns, i.e., whether they have constructed a different way of dealing with learning. This analysis, in addition to its academic and scientific value, is also relevant from the point of view of educational management and administration, a field in constant tension with social reality and almost always lagging behind it. It seems appropriate to provide information on the aspects that characterize these groups as different in order to reflect on possible appropriate educational responses.

2. Theoretical background

2.1. The generations born in a technological context Millennials and Centennials

As mentioned above, there is no single way of understanding generations, and it is often linked to the temporal component. In this sense, generations would be bearers of certain attributes that crystallize in a common way into a specific profile. This process of labelling, not without criticism, has produced generations such as the Silent Generation, Boomers, Generation X, Millennials, Centennials or Generation Alpha, all of which are defined by date of birth.

It is clear that a generation is a group of people who share certain characteristics and traits, regardless of the definition used or the time of reference. Table 1 shows the proposal of the Pew Research Center (2019), which suggests a classification of generations according to their years of birth and their main characteristics.

Table 1

Summary table of generational groups and their characteristics. Adapted from Pew Research Center (2019)

	Years of birth	Main features
Silent generation	Between 1928 - 1945	They are characterised by prudence, respect and traditional values.
Boomers	Between 1946 - 1964	They are a generation that is characterised by being committed, self-reliant and competitive.
Generation X	Between 1965 - 1980	It is a solvent, logical and resolute generation.
Millennials	Between 1981 - 1996	<i>Millennials</i> are known for being curious and non-conformist. They are also the first generation to be considered "digital natives".

Considering the different profiles mentioned above, it is clear that there is a shift in perspective when technology is introduced to the millennial generation, which has most likely had a significant impact on their culture and behaviour (Chandan, 2019). In the era of democratisation of digital technologies, education has undergone significant changes – from the way lessons are taught to the way students approach them– (Marshall, 2018). In this context, Millennials –also known as Generation Y– have played an important role in both media discourse and academic contributions. This interest is partly due to the association made by various researchers, such as Prensky (2001), who have identified this generation with specific digital skills and even coined terms to define this situation –one example of this is the concept of 'digital natives'–.

The arrival of the Centennials or Generation Z, the successor generation to the Millennials, also poses new challenges for education. Having grown up in a digital environment, they also have distinctive characteristics in their relationship with technology and learning (Seemiller & Grace, 2016). Exploring the differences between these two generations raises the question of whether Centennials have even more developed digital skills, and how these skills influence their approach to the educational process. Examining the particularities of Centennials in terms of digital skills and their impact on learning is useful to better understand the needs and preferences of this generation in the current educational context.

Undoubtedly, although there are certain similarities, there are also discernible differences between the two generations in aspects such as their patterns of consumption of digital technologies, with Millennials being those who use a greater number of screens and for longer periods of time (Giray, 2022). The same is true in the context of teaching-learning (T-L) processes, where the pre-millennial generation experiences these processes from a more social and collaborative perspective, while the next generation shows a preference for a more personalised orientation (Barnes & Noble College, 2017; Trembach and Deng, 2018).

2.2. Learning patterns and educational legislation

There are many different ways of looking at the learning process, whether from a rationalist or an empirical perspective. This debate is obviously linked to the nature of the variables that are taken into account and that are thought to influence people when they learn. For example, there are those who believe that knowledge is a purely mental creation and does not depend on external factors such as context or interaction with others. On the other hand, there are those who believe that factors such as context or interaction are key to the development of e-learning processes. If the constructivist perspective is taken as a reference, learners can be seen as constructing their own knowledge from their previous experiences and through their interaction with other users and the context (Banihashem et al., 2022). This view implies that learners are at the centre of the e-learning process and should therefore be active participants, using their strategies and being motivated.

Similarly, looking at other perspectives –from the more behavioural to the more situational– attempts have been made to define the complexity of human interaction with e-learning processes in terms of three elements –the cognitive, the affective and the conative– together with an interaction between the individual and the social dimension (Greeno et al., 1993; Lave and Wenger, 1991).

In this sense, when we think about how learning takes place, we must also take into account a variety of concepts used by different authors (Biggs, 1993; Entwistle, 1988; Hativa, 2000; Honey and Mumford, 1992; Schmeck, 1983) that may be part of it: styles, strategies, approaches, orientations or learning styles, among others. Specifically, learning style is one of the most widely used concepts and, according to Vermunt (2005), it can be defined as the particular way in which an individual approaches an e-learning process. In fact, the understanding or knowledge of learning styles and contexts has a direct relationship with the proposed educational legislation, as the identification and reflection of the elements

involved in e-learning processes is essential to promote educational approaches adapted to them (Cela-Ranilla et al., 2011).

As a complement, alternative or extension to this variety of terms, there is a term that refers to the way of approaching learning, using the term learning pattern. This concept is based on the Interactive Learning Model (ILM) developed by Johnston (1996, 2009). This model suggests that learning involves three processes: cognitive (knowing), conative (doing) and affective (feeling). The interaction of these elements results in an individual profile that is made up of four different learning patterns: sequential, precision, technical reasoning and confluence.

Each person may have a unique combination of patterns and each person has their own tendency or preference when it comes to learning. The sequential pattern defines people who are comfortable following a plan and looking for step-by-step instructions; they work in an organised way and like to complete tasks from start to finish without interruption; the precision pattern is preferred by those who need to seek and provide detailed information and ask continuous questions to obtain information; the technical reasoning pattern is used by those who like to work autonomously on practical, real-world activities, work alone without interference and demonstrate what they know by explicitly demonstrating their skills; the confluence pattern is used by those who tend to avoid conventional approaches and look for unique ways of completing any learning task, where they are willing to take risks, fail and start again.

Spain, in particular, is a country in which several social and political changes have taken place in recent years, in line with the social context described above and also with elements such as the COVID-19 pandemic. This has also been reflected in educational legislation, as changes in legislation have become frequent –from 1985 to the present day, 8 educational laws have been proposed, not counting those in the university context– (Vázquez & Porto, 2020).

In particular, the students for whom data were collected were educated during the periods covered by the Organic Law 2/2006, of 3 May, on Education (LOE) and the Organic Law 8/2013 for the Improvement of the Quality of Education (LOMCE), whose educational laws are different in terms of their main objective. The objective of the LOE is focused from a more holistic perspective, seeking to promote the physical, affective, social and intellectual development of students, i.e. it understands education as an amalgam of elements. In the second case, it has a more specific objective, focused on reducing school drop-out rates, and is conceived from a clearly industrial perspective, defining education as the engine that allows a country to move forward.

3. Method

A quantitative methodology was used in this study, using the survey technique through a validated questionnaire that was administered to university students at the Rovira i Virgili University and the University of Valladolid.

3.1. Participants

The total number of participants was 315 university students in Education from the 2006/07 and 2022/23 cohorts. The average age of this sample was 19.50 years ($SD = 2.316$), and 81% of the participants were female. Of the total number of participants, 180 belonged to the 2006/07 cohort (84.4% female) with a mean age of 19.25 years ($sd = 2.655$) and 135 students belonged to the 2022/23 cohort (76.3% female) with a mean age of 19.82 years ($sd = 1.723$).

3.2. Instruments

The variable learning patterns was coined by Johnston (1996) and based its theoretical development on the so-called Interactive Learning Model (ILM), which approached the generation of learning from a socio-constructivist approach and which configured four different types of learning patterns: Sequence, Accuracy, Technical Reasoning and Confluence. Inspired by this model, an instrument called the *Learning Connection Inventory (LCI)* was created, the design and subsequent application of which has demonstrated its validity and usefulness in scientific terms (Johnston & Dainton, 1997; 2005).

The inventory contains 28 items in a scale format of a multidimensional formative nature. Each learning pattern is represented by 7 items on which respondents are positioned on a continuum ranging from Never (value=1) to Always (value=5). The 28 items are complemented by three open-ended questions whose ultimate purpose is to refine the interpretation of the numerical results generated by the scale. Below are some examples of items from each of the learning patterns: "I get frustrated if I am given a second task before I have finished the first" (Sequence), "I take pride in giving objectively correct answers to the questions I am asked" (Accuracy), "I prefer to work autonomously without supervision or guidance from anyone" (Technical Reasoning) and "I react quickly to tasks and questions without thinking about my answers" (Confluence). The values for each pattern are calculated by summing the students' responses to the items related to each pattern; the value defining each pattern can vary between a minimum of 7 and a maximum of 35. The questionnaire is completed by a second part in which students write answers to three open-ended questions that serve to check the resulting scale values.

Below is a brief description of the characteristics that define each pattern: Sequence: a pattern associated with the tendency to follow a plan, seeking step-by-step instructions and completing tasks from start to finish without interruption. Accuracy: a pattern associated with seeking and possessing detailed information and constantly generating questions to validate one's performance. Technical Reasoning: Pattern associated with working autonomously, without interference, with a focus on practical relevance and direct applicability to the real world. Confluence: Pattern associated with an unconventional and alternative approach to tasks, risk taking and improvisation.

The authors Johnston and Dainton (2005) provide a documentary reference that reports on the validation process of the LCI in quantitative (factor analysis, test-retest, regressions, etc.) and qualitative terms, supporting both its construct and criterion validity, as well as its internal consistency or stability. In addition, it should be noted that, given the multidimensional formative nature of the LCI and the fact that it consists of five response options, its use is not expected to yield high values of Cronbach's alpha index (Elosúa &

Zumbo, 2008). This is because formative indicator models do not require covariation between measures, as the measures do not necessarily capture the same aspects of the construct domains and there is no reason to expect them to have the same antecedents and consequences (Jarvis et al., 2003).

3.3. Procedure

The questionnaire used in this study was administered at two points in time. The first collection of information was carried out between September and October 2006 in the specific context of the university's welcome week. The second administration was carried out as a practice in the context of a subject in the second semester of the academic year 2022-23, specifically in February 2023. In other words, the two data collections are separated by seventeen years and thus explore realities that correspond to two generations of university students. The questionnaire takes approximately 10-15 minutes to complete and is available in web format at both times; this method of collecting information facilitates the feeding of the database and its subsequent statistical analysis. Students were asked to consent to the use of their survey results for further research in the field of educational research.

3.4 Statistical analysis

In order to develop this work, a statistical analysis was carried out, based firstly on a parametric test, the result of which was converted into a non-parametric test of comparison of means for independent samples using the Mann-Whitney U method, and then the size of the effect was calculated using Cohen's d, in order to determine the size of the significant differences in the learning patterns of the respective samples..

4. Results

Although the type of scale used does not allow us to expect high and significant values of internal consistency between the items of each pattern (Nunnally & Bernstein, 1994; Hulland, 1999), it is important to report indices that may be useful as a reference for comparison with previous research, thus verifying their consistency in different contexts of application. Therefore, the information presented in Table 2, where Cronbach's alpha values are presented, is intended to confirm a dynamic of consistency with respect to the same values presented in previous studies (Johnston & Dainton, 2005).

Table 2*Cronbach's coefficients with respect to previous studies*

Learning patterns	α Millennials	α Centennials	α total	α total (previous studies)
Sequential	0,67	0,71	0,69	0,65
Accuracy	0,66	0,7	0,65	0,58
Technical Reasoning	0,72	0,69	0,74	0,85
Confluence	0,49	0,54	0,5	0,55

Before analysing the comparison between the two generations, descriptive statistics are presented (Table 3) to give a general idea of the frequencies, measures of central tendency and distribution of the sample.

Table 3*Descriptive statistics*

	Millennials				Centennials			
	N	Media	Medium	sd	N	Media	Medium	sd
Sequential	180	27,21	28	3,912	135	26,93	27	4,397
Accuracy	180	24,99	25	3,437	135	23,32	24	3,981
Technical Reasoning	180	19,86	20	4,62	135	24,57	25	4,296
Confluence	180	21,83	22	2,928	135	22,5	22	3,515

A Kolmogorov-Smirnov (K-S) test was also performed to test the assumption of normality before the comparative analysis between the defined groups. The K-S test indicated that the distribution did not meet the normality assumption and it was therefore decided to perform the non-parametric Mann-Whitney U test for comparison of two independent samples.

According to the Mann-Whitney U test, the Centennial students have statistically significantly higher scores than the Millennial students with respect to the Technical Reasoning pattern. In other words, Centennial students are more oriented towards using a pattern associated with working autonomously, without interference, oriented towards practical relevance and directly transferable to the real world. On the other hand, Millennial students show statistically significantly higher values than Centennial students with respect to the Precision pattern, i.e. the pattern associated with searching for and possessing detailed information (see Table 4).

Table 4*Mann-Whitney U-test for learning patterns (Millennials vs. Centennials)*

Learning patterns	Z	p
Sequential	-0,697	0,486
Accuracy	-4,049	0
Technical reasoning	-8,259	0
Confluence	-1,927	0,054

To complete the test, the effect size was calculated, which shows that the statistically significant difference is very large in the case of the Technical Reasoning standard (Cohen's $d = 1.050$) and moderate in the case of the Accuracy standard (Cohen's $d = 0.454$).

5. Discussion and conclusions

Each generation of students has its own peculiarities, characteristics and needs, which are reflected in their tastes and consumption styles. Throughout the research collected in this article, certain differences in the way Millennials and Centennials organise themselves and access knowledge have been identified.

Analyzing these differences between the two groups, it can be seen that Millennials have a more precise profile, i.e. according to Calleja's (2005) definition, they have a greater predisposition or tendency to carry out tasks related to the search for information, the desire to find answers and the search for intellectual challenges. They also tend to feel good about doing what is perceived to be right, and feel frustrated when someone does not share the information available to them. Authors such as Roberts et al (2012) agree with this view of Millennials, highlighting how important it is for us as teachers to provide them with intellectual challenges that motivate and challenge them in ways that they cannot solve by searching the internet alone.

Centennials, by contrast, tend to have a technical mindset, which implies a more efficiency-oriented style, focusing only on the information they need to do something specific. Likewise, they can be characterized as decisive and quick to act when faced with an experiential challenge. This generational profile tends to feel good when they are self-sufficient and frustrated when the tasks they perform do not directly translate into their reality (Calleja, 2005). In short, Centennials prefer to have more experiential experiences than usual and tend to rely on mobile phones and laptops to solve them (Paulina & Ernawati, 2022).

Given this situation, it is essential that both educational administrations and institutions and teachers are aware of the importance of, on the one hand, as indicated by Céspedes and Gutierrez (2017), adapting to the new times by developing skills related, for example, to the use of digital tools to be part of –or understand– the reality of their students and, on the other hand, adapting and rethinking the teaching-learning (T-L) processes with the intention of taking into account the training deficits that need to be reinforced and the strengths that need to be enhanced in order to properly motivate and accompany students (Hernandez-

de-Menendez et al. , 2020). In this sense, it is noteworthy that the current educational legislation –Organic Law 3/2020, of 29 December, which amends Organic Law 2/2006 (LOMLOE)– shows a certain intention to adapt to the new so-called alpha generation, through elements such as the definition of key competences –which for the first time include digital competence– and learning situations that have a much more global, experiential and utilitarian character.

In the context of higher education, it is appropriate to propose an educational practice consisting of getting to know the students who will occupy university classrooms in future years. It may not be necessary to make a generational diagnosis, but it is necessary to promote a comprehensive analysis of the characteristics of today's young people. It is also necessary to strengthen the link between the pre-university stage and the scenario in which students find themselves in the first years of university, just as reflections are being made on the disconnection between the university world and the labor market (Cela-Ranilla & Gisbert, 2013).

Nevertheless, it should be noted that this study focuses on two specific generations from two Spanish universities with similar characteristics, and therefore it is considered reasonable to recall the importance of teachers spending some time getting to know the specific characteristics of their class group, based on the principles of inclusion and the development of the social and personal identity of all students (Álvarez-Pérez et al., 2012). In order to facilitate the adaptation of T-L proposals, it would be interesting, on the one hand, to continue this research process through an analysis of teaching experiences designed taking into account generational characteristics, with the intention of identifying successful good practices that can be transferred and adapted in other university contexts, and, on the other hand, to begin to think about what the needs of the alpha generation will be when they arrive at higher education institutions around the year 2030.

Authors' contribution

A. S.-C.: Conceptualization, Writing – Original Draft and Writing – Review & Editing; **J.C.-R.:** Investigation, Methodology, Writing – Original Draft and Writing – Review & Editing; **F.E.-M.:** Writing – Original Draft and Writing – Review & Editing.

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Aplicaciones tecnológicas relacionadas con la edad temprana infantil

Technology applications related to early childhood

Coordinadora:



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Introducción

Decir que las aplicaciones tecnológicas están relacionadas con la primera infancia es quedarse corto.

La primera infancia es un estadio de desarrollo que mejora la vida escolar. Es la etapa más importante para cambiar la vida futura de un niño. La educación de un niño empieza en casa.

La tecnología determina la calidad de la educación temprana de un individuo. La educación infantil mejora los conocimientos, las habilidades y desarrolla la personalidad y la actitud de los niños. Sobre todo, la tecnología en la primera infancia afecta la familia del niño.

Un niño con un alto grado de ayudas tecnológicas aumenta su capacidad de desarrollo.

En este monográfico sobre la importancia de las aplicaciones tecnológicas relacionadas con la primera infancia, discutiremos su valor en la escuela y la familia.

To say that Technology applications related to early childhood is an understatement.

Early childhood is a weapon to improve school life. It is the most important stage for changing future lives. A child's education begins at home.

Technology certainly determines the quality of an individual's early education. Early childhood education improves knowledge, skills and develops personality and attitude of children. Most notably, early childhood technology affects a child's family.

A child with a high level of technological aids increases their developmental capacity.

This monograph on the importance of technology applications related to early childhood will tell you about its value in school and family.

Alcance

El monográfico **Aplicaciones tecnológicas relacionadas con la edad temprana infantil** abordará intervenciones tecnológicas tempranas para niños con necesidades especiales, modelos de atención integral que proporcionan servicios tecnológicos y apoyos de manera holística, abordando las necesidades del niño y su familia de manera coordinada, avances tecnológicos en el diagnóstico precoz con la colaboración de distintos profesionales (médicos, terapeutas, educadores y trabajadores sociales), e investigaciones tecnológicas recientes sobre educación temprana

*The monograph **Technology applications related to early childhood** will address early technology interventions for children with special needs, integrated care models that provide technology services and supports holistically, addressing the needs of the child and family in a coordinated way, technology advances in early diagnosis with the collaboration of different professionals (doctors, therapists, educators and social workers), and recent technology research on early education.*

Descriptores/Líneas Temática

- Modelos tecnológicos para la educación temprana
- Guía para padres y madres sobre edad temprana
- Uso de tecnologías digitales para educación temprana
- Educación informática integrada en tecnología para la primera infancia
- Relación entre los antecedentes de los futuros maestros y el uso de la tecnología en la educación infantil: visión comparada
- Relación entre los antecedentes de los futuros maestros y el uso de la tecnología en la educación infantil: estudio de caso
- Comunicación educador-cuidador a través de la tecnología
- Aplicación tecnológica para la medición del desarrollo infantil: estudio comparado
- Aplicación tecnológica para la medición del desarrollo infantil: estudio de caso
- Revisión de la literatura de naturaleza empírica sobre el uso de la tecnología en la educación temprana
- Tecnología y sostenibilidad en el cuidado de la educación temprana

- El desarrollo artístico en la educación temprana con ayuda de dispositivos tecnológicos
- Los juegos y las actividades dramáticas en la educación temprana
- Mapeo bibliográfico y análisis de contenido en la educación científica de la primera infancia
- Educación tecnológica temprana en países europeos: estudio de caso
- Uso de la realidad virtual (VR), la realidad aumentada (AR) y la realidad mixta (MR) en educación temprana
- De la gamificación a la IA en educación temprana
- Aplicaciones móviles para niños con necesidades educativas especiales.

- *Technology models for early childhood education*
- *Parent's Guide to Early Childhood*
- *Use of digital technologies for early education*
- *Technology-integrated computer education for early childhood*
- *Relationship between prospective teachers' backgrounds and the use of technology in early childhood education.*
- *Educator-caregiver communication through technology.*
- *Technological application for the measurement of child development: a comparative study*
- *Technological application for the measurement of child development: case study*
- *Review of the empirical literature on the use of technology in early education*
- *Technology and sustainability in early childhood education care*
- *Artistic development in early childhood education using technological devices*
- *Games and dramatic play activities in early education*
- *Bibliographic mapping and content analysis in Early Childhood Science Education*
- *Early Technology Education in European countries: a case study*
- *The use of virtual reality (VR), augmented reality (AR) and mixed reality (MR) in early education*
- *From gamification to AI in early education*
- *Mobile applications for children with special educational needs.*

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