Impact of Digital Tools to Attend to Educational Diversity

Danilo Marcelo Diaz Quichimbo[1], Jeferson Dario Crespo Asqui[2], Veronica de Lourdes Lligalo Maliza[3], Miguel Eduardo Vásconez Campos[4]

Abstract

In contemporary society, digital tools are the best allies of teachers, since they contribute to the generation of learning in harmony with the needs of students. This research aims to analyze the impact of digital tools to address educational diversity in students of the Master's Degree in Education, Major in Pedagogy in Digital Environments at a public university in Ecuador. A methodology was used based on the mixed approach that combined the quantitative with the qualitative; This was supported by a descriptive study that allowed the assessment of the diversity present in the students. As a methodology, action research was used, which allowed the prominence of the educational subjects. The techniques used were the survey, interview, and observation aimed at educational actors. The results showed that collaborative digital tools allow assessment from the diversity of age, gender, religion, in adherence to values and principles. As conclusions, it is highlighted that digital tools must be framed in a sequenced process to achieve learning objectives in response to the diversity presented by teachers.

Keywords: *Collaboration, Educational Diversity, Digital Tools, Teachers, Sequenced Process.*

Introduction

Information and Communication Technologies (ICT) currently have an impact on the daily tasks that people perform, in some cases allowing work to be more efficient. In this idea, the digital tools that provide to carry out communicative, interactive, participatory processes appear and in the educational field allow the mediation of contents, achievement of learning objectives and with it the generation of inclusive and diverse environments.

For this reason, digital tools present a variety of opportunities and benefits that facilitate the learning objectives contemplated in the units of study. They lend themselves to working in different areas with activities that range from the simple to the complex, in other words, they meet the needs, rhythms and styles of the students. For Serna and Alvites-Huamaní (2021) they emphasize that virtual education has transformed the didactic processes from traditional education to the modern challenges of the digital age, this is thanks to the digital dominance of students and the incursion of Information and Communication Technologies in educational spaces.

Thus, digital tools enable cloud storage, real-time collaboration, the use of artificial intelligence and the automation of tasks, which generate greater prominence for students. Calle-González et al. (2021) explain that there are currently various digital tools that contribute to promoting interactive education, which integrates play to work on emotional, cognitive, and motivational aspects, that is, it highlights the active roles that each actor must play, one of the educational actors.

As technology advances, so do digital tools applied to educational contexts and therefore require new challenges to be taken on by educational actors, mainly teachers, for this opportunities for personal and professional growth are generated since these tools provide the possibility of developing creativity, innovation and with it the transformation of educational work. For this reason, García Martín and García Martín (2021) state that the integration of educational technologies in teaching involves a complex process

---

[1] Master's Degree in Inclusive and Intercultural Education, Independent Researcher, Email: danilodiaz28@gmail.com, https://orcid.org/0000-0002-1073-5524

[2] Master's Degree in Biology, Independent Researcher, Email: crespo.jeferson22@gmail.com, https://orcid.org/0000-0002-0646-2068

[3] Master's Degree in Human Rights, Independent Researcher, Email: lourdes.lourdes1@gmail.com, https://orcid.org/0009-0009-9947-7960

[4] Master's Degree in Educational Inclusion and Attention to Diversity, Independent Researcher, Email: miguelvasconez_campos@hotmail.com, https://orcid.org/0000-0002-6644-3918

involving various factors such as personal factors reflected in gender, experience, age and contextual factors that emphasize the acceptance and integration of technologies by teachers in the classroom.

However, although technology advances, there are still limitations in terms of access and adoption in rural realities. The lack of infrastructure, the lack of training, the scarcity of economic resources are aspects that need to be strengthened and addressed in these contexts. From there, it implies the challenge of attending to diversity, which seeks to mitigate the digital divide and ensure that all individuals have learning opportunities with the effective use of ICTs.

On the other hand, educational diversity is an opportunity to enrich everyone's learning, since it serves students with different abilities, competencies, needs, cultural identities, age, and gender. Recognizing diversity in classrooms is essential to generate inclusive, diverse, and equitable spaces in accordance with the values of each student. For Bravo Mancero and Santos Jiménez (2019) they express that there are still rigid aspects that try to homogenize the ways in which students should behave, hindering cognitive competencies.

In this sense, educational diversity constitutes an opportunity to enrich the learning experience of all students. By interacting and collaborating with peers who have different ways of thinking, learning, and experiencing the world, students gain a broader view and develop critical thinking and empathy skills. From another perspective, diversity contributes to the training of students to face a complex society, of the digital age, in which the dialogue of experiences from different cultures is encouraged. For this reason, Zhigue-Luna and Sanmartin-Ramón (2019) conceive that quality education is equivalent to educating with inclusion, where the school must take on the challenge of providing responses adjusted to the diversity that each subject presents, which is reflected in ethnicity, sex, age, cognitive and mental abilities, creed, among others.

However, addressing educational diversity also presents challenges for educators. That is equivalent to leaving behind prejudices, stereotypes and giving a sensitive and respectful approach to the student, To do this, the processes must be planned and the identification of strategies and resources that meet each of the needs of the students and also reinforce the learning of the students who require it. In this sense, teacher training is essential to guarantee an education in harmony with the interests of educational actors.

Educational diversity is committed to serving students who have educational needs or disabilities. This implies that students feel included, valued, motivated in the development of activities, tasks, in such a way as to generate ecosystems of opportunity for all. This implies promoting environments free of exclusion, discrimination, harassment to live together and learn from everyone. In the face of this, the challenge is enormous. Valdivieso et al. (2019) explain that future teachers must be trained with educational inclusion approaches, this will guarantee the predisposition to promote teamwork with students, valuing comprehensive training for the construction of citizens committed to contemporary society.

Consequently, educational diversity assumes great challenges and opportunities in the classrooms since by embracing the diversity that each student presents, the possibility of enriching the different learning environments is given, allowing the generation of inclusive, intercultural spaces that motivate the student to participate actively. The appreciation of educational diversity allows the formation of individuals with values, principles that do not allow for exclusive contexts

Therefore, this research was carried out with the students of the Master's Degree in Education, Mention in Pedagogy in Digital Environments, cohort 2022 of a public university in Ecuador, who are characterized by the educational diversity they present, which is reflected in age, gender, ideology, potentialities, needs, the development of digital skills. To this end, the objective was to analyze the impact of digital tools to address educational diversity on students.

Theoretical Framework

Digital Tools

Berrocal Hernández and Aravena Domich (2021) through their research: "Digital tools as a resource for communicative interaction in schools in Colombia" show the relevance of digital tools for the generation of the school diary and with it the enhancement of reading and writing in students of Colombian educational institutions, on the other hand, the opportunity to stay in communication with that resource is rescued; consequently, the tools digital promote the dissemination of academic events that give rise to the empowerment of ICT for the entire educational community and thus encourage the exchange of expressions on the educational platform. On the other hand, it is announced that the students who participate in the construction of the digital school diary have the possibility of reinforcing writing, an important aspect for publications and on the other hand criticality in the selection of effective information; All this contributes to the improvement of educational quality and to walk in tune with the advances presented by today's society.

According to Pazmiño Campuzano et al. (2022) through their study: "Digital educational tools used at the secondary level and their importance in academic performance" they refer that the use of digital classrooms favors the attention of students in classes, stimulates motivation, teamwork, dynamizes the understanding of the contents and favors active protagonism. In the area of Mathematics, digital tools lend themselves to promoting a positive, significant and social impact that affects the entire educational community. In this sense, the teacher must select the digital tools in accordance with the contents of each subject, for example, blogs, podcasts, wikis, messaging, searches have a significant impact on areas such as Linguistics and Natural Sciences.

Educational Diversity

For Carrillo Vargas and Moscoso Jurado (2022) in their research: "Educational inclusion and attention to diversity in education" they conceive that inclusive education constitutes an enormous challenge that the educational system must assume in its components: strategies, resources and structures, for this teachers must generate didactic processes in which everyone can participate and self-esteem is favored, creativity, cooperative work, heterogeneity and reciprocal learning. For this reason, teachers must leave traditional methodologies to make way for inclusive and active methodologies that consider cognitive processes in which how each individual learns is valued. In this sense, the work of the educator is crucial for meeting the different needs of each individual and achieving learning and full competencies in a complex society and the digital age.

According to Rojas-Avilés et al. (2021) in their study: "Perceptions of inclusive education in Ecuador" emphasizes that the obstacles to educational inclusion arise from the barriers of the thinking of educational actors, the teacher's fear of attending to students with individual differences, so a curriculum must be managed that meets the needs of students and, to the extent possible, the promotion of educational innovation. Therefore, respect for the dignity of the individual is important to generate a society that values and tolerates the differences that each subject presents. In this sense, the initiative of educational innovation must be born from teachers and this is evident in the classrooms and in the vocation of each professional. Teacher training in educational inclusion should be the letter of introduction in response to diversity, which implies going beyond a state policy.

Materials and Methods

In this study, the socio-critical paradigm was used since questioning, analysis, reflections were made in the face of the identified difficulty, its diagnostic process, in this way determine the incidence of digital tools in the face of educational diversity. In this sense, Ticona et al. (2020) consider that this paradigm entails a series of intervention processes to have a significant impact on social contexts and thus encourage the reflection of subjects in the face of the identified problem.

As far as the approach is concerned, it corresponds to the mixed one, since it merged quantitative and qualitative aspects for the interpretation of the identified reality in the face of the diversity of the students, their needs, potentialities, skills in their fourth-level training process and in this way embrace diversity as a source of richness. From Daza's (2018) research, he expresses that the qualitative approach accurately deepens praxis, which affects the awareness of social elements. For his part, Rodríguez (2017) emphasizes that the quantitative approach focuses on situations that merit measurement and observation, for which principles of statistics and mathematics intervene in the collection of data.

Descriptive research was key to the analysis of the aspects that allowed the impact of digital tools to assess the educational diversity of each master's student, as well as their knowledge, experience, and strengths in the educational field. In the words of Guevara et al. (2020), description allows the collection of information, the identification of situations, attitudes through exact processes and guided by objectives.

The method used corresponds to the action research method by its particulars that allowed the participation of the educational subjects in the identification of the problem and the intervention with digital tools that respond to the needs of the master's students. For Botella, Nicolás and Ramos Ramos (2019) conceive that the action research method can be applied in innovative contexts in order to improve didactic practices, methodologies, strategies, and the learner's environment.

The techniques of the survey and interview aimed at the master's students with open and closed questions were essential in the precision of the digital tools to meet the needs and potentialities that each student presented. The students who participated in the research process were the 11 students of the Master's Degree in Pedagogy, Mention in Pedagogy in Digital Environments Cohort 2022, from a public university in Ecuador, from urban and rural contexts, with teaching practice in public and private institutions, the cultures to which they belong are the mestizo and Kichwa, of various ages in some cases a disability is identified, The particularities are detailed below:

Table I. Sociodemographic Characterization of Master's Degree Students

| Variables	Categories	N	%
Age	20 – 30 years	5	46,0
	31 – 40 years	3	27,0
	41 – 50 years	1	9,0
	51 years and older	2	18,0
Gender	Male	5	46,0
	Female	6	54,0
Culture	Mestizo	10	91,0
	Kichwa	1	9,0
Disability (Auditory)	Yes	1	9,0
	No	10	91,0
Support	Fiscal	8	73,0
	Particular	3	27,0

Source: Own elaboration

The aforementioned students carry out their training in the online modality supported by a digital platform equipped with digital tools for each module and Microsoft Teams for synchronous meetings. Among the tools used for the study and that are considered to promote respect for diversity from the students' perspective are: virtual forum, padlet, social networks, voki, worditout; On the other hand, the tools that allow active processes: Wordwall, Classtools, EducaPlay. With regard to the tools that allow the dissemination of knowledge are: virtual letter, virtual newspaper, educational memes, infographics; they fulfilled certain functions and supports in their training process.

Results

As can be seen in Table I, the particularities presented by the teachers are unique and diverse, which allows them to interact, bring out their skills, competencies and learn according to their styles, learning rhythms, interaction with their classmates, the accompaniment of teachers and also mediated by the benefits offered by educational technologies. In this sense, in the survey aimed at the master's degree students, important data can be rescued that are the product of the experience in the classrooms where they teach and above all from the sharing in the master's program, so when consulting about the digital resources that are used to promote educational inclusion in the classrooms, Most believe that social networks are the best allies to achieve these processes:

Figure I. Digital Resources to Promote Educational Inclusion
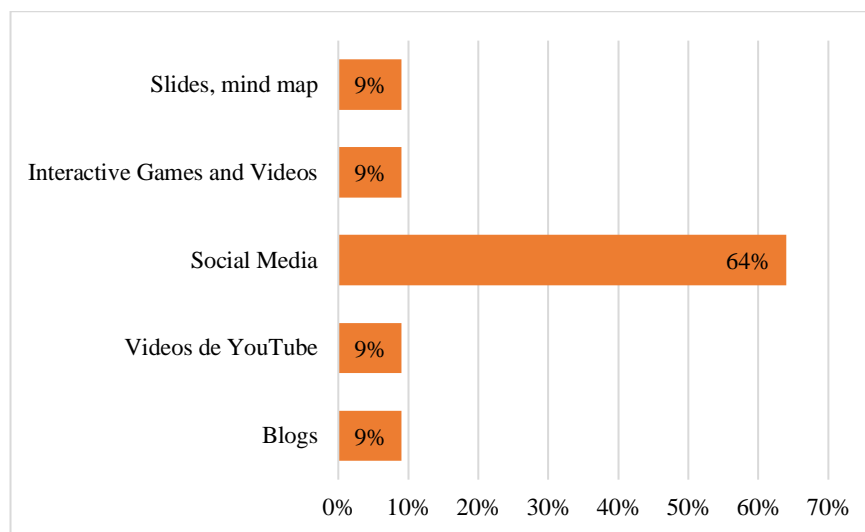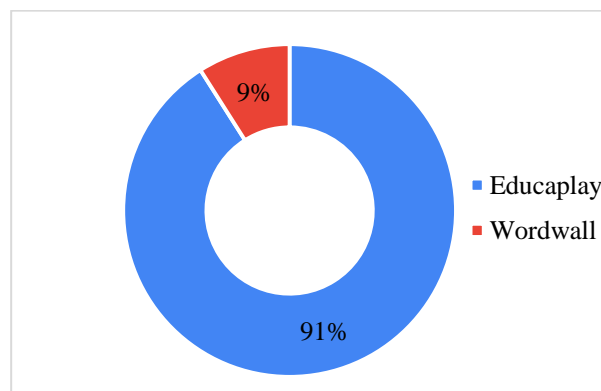

Source: Own elaboration

These data show the pedagogical benefits offered by social networks, but above all those inclusive tints that they generate unconsciously and these refer to those that are currently used by most people: *TikTok, WhatsApp, Instagram, Messenger, YouTube.* Therefore, its use with prior planning, which is careful when considering the diversity of students, must also be related to the contents that will be addressed, this to guarantee the fulfillment of the learning objectives.

With regard to those digital resources that are considered to promote spaces of respect for educational diversity, the Padlet stands out, the virtual forum, that is, in them an exchange of experiences, knowledge, feedback, reinforcement of content in educational actors is promoted, but on the other hand, they constitute environments to promote the values of respect, tolerance, responsibility, empathy, punctuality; To this end, it is ideal that they are integrated and energized in the teaching-learning processes:

Figure II. Digital Resources That Generate Respect for Educational Diversity
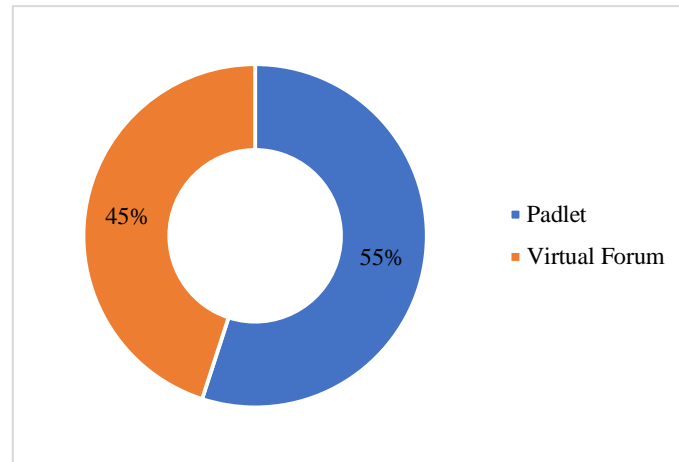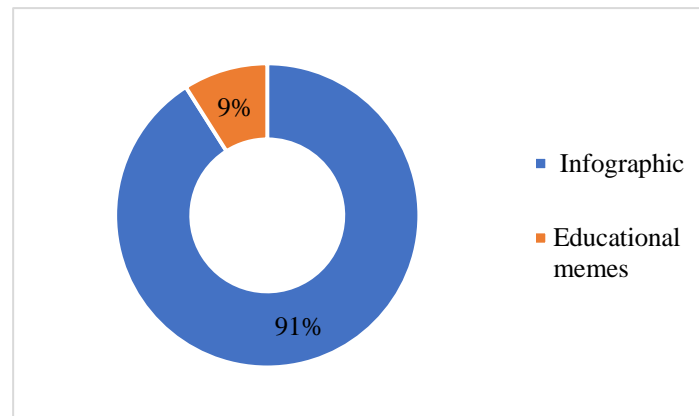

Source: Own elaboration

On the other hand, it is also important that students in learning environments feel comfortable and participate actively and responsibly, without any discrimination, supported by different strategies and resources; In view of this, we inquired about those digital resources that are considered to allow the creation of active and dynamic processes in the classrooms, for this, in which Educaplay and Wordwall stand out for their different tools that contain and lend themselves to address the contents in different areas:

Figure III. Digital Resources That Generate Active Processes

Source: Own elaboration

With regard to digital resources for the dissemination of knowledge more effectively, infographics and educational memes stand out, which constitute new and fun ways of generating learning, especially their incorporation into texts makes their understanding dynamic and aligned with social networks they make a team to reach students, Stimulating visual learning styles, hence the commitment to incorporate these resources for educational, inclusive purposes. They also generate various emotions, reactions, creativity and security in what each student builds:

Figure IV. Digital Resources for the Dissemination of Knowledge

Source: Own elaboration

From another perspective, it is important to emphasize the relevance that the researchers give to the aspects that intervene in the teaching work and that have a direct connection with educational diversity; these are grouped into: benefits of ICT, didactic processes, participation, educational inclusion. In the former, the pedagogical work that brain gymnastics activities occupy in educational processes is highlighted, the opinion of the students reflected in word clouds or on the other hand for the consolidation of content is given to an educational judgment in which the educational actors simulate real situations and fulfill active roles, participatory, inclusive in the educational field for the solution of an identified problem. These perceptions can be evidenced in the following table:

Tabla Ii. Percepción De Las Tic Y La Diversidad Educativa

Aspects	Items	Results
Bondades de las TIC	How pertinent do you consider ICT in the teaching-learning processes?	100% of respondents believe that ICTs are relevant to be applied in education.
	How often do you use ICT in educational processes?	Most of the researchers conceive that they frequently use ICT in their classrooms.
Didactic process	Do you think that YouTube videos shared in class are spaces that cater to educational diversity?	The majority of respondents strongly agree that YouTube videos are great resources for catering to diversity.
	Do you conceive that graphic organizers are tools that help in the consolidation of learning?	Most agree that graphic organizers lend themselves to the consolidation of various content.
Participation	Do you think that the shared brain gymnastics activity in class awakens interest in learning?	The majority of respondents support that brain gymnastics contributes to energizing classes.
	Do you think that a word cloud in Worditout values the opinion of each student?	Everyone conceives that a word cloud gives importance to the expressions of each student.
Educational inclusion	Do you conceive that an academic essay worked collaboratively and online promotes educational inclusion?	100% of those investigated agree that the online academic essay allows educational inclusion.
	Do you consider that in an educational judgment the contents addressed in	The educational game is supported by the majority of respondents as a resource to integrate various content

class are evidenced and educational inclusion was promoted?	and to promote educational inclusion.

Source: Own elaboration

The results of the interview from the voice of the investigated are evident when it comes to knowing their perspective of inclusion in their training processes, so when inquiring about the most impactful digital tools that allow us to respond to educational diversity:

The use of subtitles in *YouTube* videos for people with hearing disabilities, educational videos for people with intellectual disabilities, educational games for people with learning difficulties are ways that raise awareness of the value of diversity (Interviewee 1, personal communication, January 21, 2023).

This undoubtedly provides the necessary guidelines to better use those resources that meet the learning styles of students. It is also important to note that those inclusive processes through the use of ICTs taught in the master's program are taken to the respective classrooms, with touches of innovation, didactic sequences, and inclusion of parents, adapted to the various contexts:

The topic of vowels was raised, in which the identification of sound and its association with spelling was raised. Then they watched an interactive video of the vowels where the children learned the vowel song. Later we played with different graphoplastic techniques to memorize the shape of each of them. As a consolidation activity, the link to the interactive game was sent to reinforce what was learned with parents through the *WhatsApp* group (Interviewee 2, personal communication, January 21, 2023).

Discussion

Technology is constantly advancing, leaving positive and negative impacts for society in recent times, in the same way it affects the daily coexistence of people. Education is no exception, it has to take on challenges that require updating, innovation, and constant training of teachers, thus guaranteeing the effective use of digital tools in educational processes for the generation of harmonious and inclusive environments:

They offer more interactive, motivating learning, contribute to the development of skills for research, innovation, and also lend themselves to the socialization of information and knowledge. On the other hand, they encourage interaction between teacher, student, parents, to unite diverse experiences and generate new knowledge (Interviewee 3, personal communication, January 21, 2023).

In this sense, there is no doubt that ICTs came to society and the educational field to stay, to make learning accessible to students, of course if the teacher allows it. In the studies by Orellana-Fernández et al. (2020) consider that ICTs are those collaborative and constructivist learning tools that can be used at all levels of the educational system, students become the architects of their learning process with the help of a motivated and trained teacher to achieve the objectives, they also promote learning by discovery.

Following this line, ICTs favor collaborative learning, which allows the point of view of each student to be valued and their active participation in their training, that is, educational inclusion is encouraged. For this reason, Daquilema Cuásquer et al. (2019) are critical in arguing that the incorporation of ICT skills anchored in education requires didactic strategies that favor cooperative environments in which the student achieves mastery.

However, if ICTs are not used in the correct way, they constitute various forms of distraction in students, before this a teacher must have the ability to discern at what time of the class they can be used and how they can achieve didactic sequences. In the words of Batanero (2019), he believes that ICTs, if not managed correctly, can generate superficial, incomplete, confusing learning and constant anxiety about computer interaction. Given this, it is important to take a look at what a person under investigation says:

I start by projecting a video of a topic, I form work groups and ask a reflection question based on the video observed, I ask them to work through brainstorming. I present the information of the topic in a brief and summarized way, I use the space for the students to ask questions about the topic. I request that students carry out activities around the topic: mindfacts, mind maps, recorded interviews, presentations, etc. (Interviewee 4, personal communication, January 21, 2023).

For this reason, it is important to use digital tools aligned with curricular planning, which respond to educational objectives in accordance with the needs of students and their contexts and thus contribute to a fair and equitable society.

Conclusions

Digital tools, reflected in social networks, padlet, virtual forums are the best allies to talk about and value attention to diversity in aspects of respect for the culture, gender, age, socioeconomic condition that students present, these have to be planned in advance to achieve the desired objectives.

The educaplay, the wordwall are digital tools that dynamize learning, by allowing the active participation of students, therefore, there is also talk of promoting educational inclusion, leaving aside processes of discrimination, exclusion, generation of stereotypes.

As for the application of brain gymnastics activities, the educational judgment promotes interest in learning, in actively participating in the educational process, this implies that use must be in tune with the contents, with the needs and potentialities that each individual presents, to ensure that everyone feels important and involved in the educational act.

On the other hand, infographics, educational memes lend themselves to disseminate the knowledge, learning, and experiences of each student in such a way as to value their contribution to the construction processes and acquisition of knowledge; on the other hand, the generation of emotions, the exchange of points of view makes learning flow in a meaningful and motivating way.

References

Batanero, J. M. F. (2019). Formación del profesorado para la incorporación de las TIC en alumnado con diversidad funcional. Ediciones Octaedro. https://dialnet.unirioja.es/servlet/libro?codigo=865588

Berrocal Hernández, A. A., & Aravena Domich, M. A. (2021). Herramientas digitales como recurso de interacción comunicativa en escuelas de Colombia. Ciencia Latina Revista Científica Multidisciplinar, 5(5), 7302-7320. https://doi.org/10.37811/cl_rcm.v5i5.848

Botella Nicolás, A. M., y Ramos Ramos, P. (2019). Investigación-acción y aprendizaje basado en proyectos. Una revisión bibliográfica. Perfiles educativos, 41(163), 127-141. https://dialnet.unirioja.es/servlet/articulo?codigo=7177077

Bravo Mancero, P., & Santos Jiménez, O. (2019). Percepciones respecto a la atención a la diversidad o inclusión educativa en estudiantes universitarios. Sophia, colección de Filosofía de la Educación, (26), 327-352. https://doi.org/10.17163/soph.n26.2019.10

Calle-González, A., García-Herrera, D., & Mena-Clerque, S. (2021). Uso de herramientas digitales en Educación Inicial frente a pandemia. CIENCIAMATRIA, 7(13), 66-84. https://doi.org/10.35381/cm.v7i13.472

Carrillo Vargas, C. M., & Moscoso Jurado, D. E. (2022). La inclusión educativa y atención a la diversidad en educación. Ciencia Latina Revista Científica Multidisciplinar, 6(5), 56-71. https://doi.org/10.37811/cl_rcm.v6i5.2908

Daquilema Cuásquer, B. A., Benítez Flores, C. R., & Jaramillo Alba, J. A. (2019). Desarrollo de las habilidades TIC en los estudiantes. Sociedad &Amp; Tecnología, 2(2), 36–44. https://doi.org/10.51247/st.v2i2.48

Daza, W. (2018). Investigación educativa desde un enfoque cualitativo: la historia oral como método. Voces De La Educación 3(6), 110. https://dialnet.unirioja.es/servlet/articulo? código=6521971

García Martín, J., & García Martín, S. (2021). Uso de herramientas digitales para la docencia en España durante la pandemia COVID-19. Revista Española De Educación Comparada, (38), 151–173. https://doi.org/10.5944/reec.38.2021.27816

Guevara, G., Verdesoto, A., & Castro, N. (2020). Metodologías de investigación educativa (descriptivas, experimentales, participativas, y de investigación-acción). Recimundo, 4(3), 163-173. http://www.perspectivaeducacional.cl/index.php/peducacional/article/viewFile/645/266

Orellana-Fernández, O. F., Garcia-Herrera, D. G., Castro-Salazar, A. Z., & Erazo-Álvarez, J. C. (2020). Iniciación a la lectura a través de las TIC: Una propuesta metodológica. Revista Arbitrada Interdisciplinaria Koinonía, 5(1), 673–691. https://doi.org/10.35381/r.k.v5i1.804

Pazmiño Campuzano, M. F., Moreira Sánchez, J. L., Hernández Ponce, E. A., & Cedeño Campuzano, I. M. (2022). Herramientas digitales educativas utilizadas en el nivel medio y su importancia en el rendimiento académico. Revista Científica Sinapsis, 2(21). https://doi.org/10.37117/s.v2i21.655

Rojas-Avilés, H., Sandoval-Guerrero, L., & Borja-Ramos, O. (2021). Percepciones a una educación inclusiva en el Ecuador. Cátedra, 3(1), 75–93. https://doi.org/10.29166/catedra.v3i1.1903

Serna, R. y Alvites-Huamaní, C. (2021). Plataformas Educativas: Herramientas digitales de mediación de aprendizajes en educación. Hamut´ay, 8 (3), pág. 66-74, http://dx.doi.org/10.21503/hamu.v8i3.2347

Ticona, R. M. L., Condori, J. L. M., Mamani, J. S. M., y Santos, F. E. Y. (2020). Paradigma sociocrítico en investigación. PsiqueMag, 9(2), 30-39. https://doi.org/10.18050/psiquemag.v9i2.2656

Valdivieso, P. A. V., Pincay, G. Z., Pilligua, P. Y. V., & Cedeño, G. M. B. (2019). Modelos de planificación educativa y diversidad en aulas de clases. CIENCIAMATRIA, 5(9), 302-315. https://doi.org/10.35381/cm.v6i10.149

Zhigue-Luna, A. R., & Sanmartin-Ramón, G. S. (2019). Gerencia educativa e inclusión: una mirada a la diversidad. Visión Gerencial, (2), 324-332. https://www.redalyc.org/journal/4655/465566915014/465566915014.pdf