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Gender Digital Divide and Women’s Digital Inclusion: A Systematic Mapping

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Abstract

The digital divide is a multiple phenomenon that visualizes inequalities in the access, use, and appropriation of information and communication technologies (ICTs) of disadvantaged groups to others. There are currently several digital divides, such as a) the Gender Digital Divide (GDD), b) the generational digital divide, c) the disability digital divide, d) the educational digital divide, and e) the geographic digital divide. Specifically, the Gender Digital Divide exhibits a digital divide between women and men. This issue can be increased or decreased depending on the specific background of each woman. This study aims to provide a current and comprehensive overview of recent studies about the gender digital divide from 2017 to 2021, identifying key topics that require further exploration for a complete understanding of the topic through a systematic mapping. Findings show that recent studies have focused on analyzing the differences and inequalities between women and men regarding access, use, and appropriation of ICTs. For future years, it is needed more research on the subject.

Keywords

Digital divide, gender inequalities, women, digital inclusion, gender digital divide

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Brecha Digital de Género y la Inclusión Digital de Mujeres: un Mapeo Sistemático

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Resumen

La brecha digital es un fenómeno múltiple que visualiza desigualdades de acceso, uso y apropiación de las tecnologías de la información y la comunicación (TIC) de grupos desfavorecidos respecto a otros. En la actualidad, existen diversas brechas digitales como: a) la brecha digital de género (BDG), b) la brecha digital generacional, c) la brecha digital por discapacidad, d) la brecha digital de educación, e) la brecha por uso o ubicación. Específicamente, la brecha digital de género exhibe una brecha digital de las mujeres respecto a los hombres. Esta problemática puede maximizarse o disminuirse dependiendo de la situación específica de cada mujer. El objetivo de este estudio es ofrecer una visión actualizada y general de la investigación académica sobre la brecha digital de género de 2017 a 2021, identificando temas clave que requieren un análisis más detallado para un entendimiento profundo, a través de un mapeo sistemático. Los hallazgos demuestran que los estudios actuales se han enfocado en analizar las diferencias y desigualdades entre mujeres y hombres respecto al acceso, uso y apropiación de las TIC, además se requiere mayor producción respecto al tema para los siguientes años.

Palabras clave

Brecha digital, desigualdades de género, mujeres, inclusión digital, brecha digital de género

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The digital divide is defined as the social inequity among individuals regarding 1) access to information and communication technologies (ICT), 2) frequency of ICT use, and 3) ability to use ICT for various purposes (Ercikan et al., 2018). Nowadays, there are several digital divides such as: a) the generational digital divide, b) the geographic digital divide, c) the digital divide for disability, d) the educational digital divide, e) the gender digital divide (GDG) (Arias-Fernández et al., 2018; Colom, 2020; Galperín, 2017). Ramírez-Castañeda and Sepúlveda-López (2018) establish that the digital divide is a complex and multidimensional phenomenon that needs to be visualized from social and technological aspects since it should be analyzed from the access to ICT tools of each person and group characteristics related to digital inequalities (Afiani, 2018).

The term digital divide has its origin in the post-industrial era and the knowledge society with the Technological Revolution in the United States and Europe. This event generated a demand in the computational and informational area and gave the possibility of accessing information and generating more inclusive and democratic societies (Berrío-Zapata et al., 2017; Cabero-Almenara & Ruiz-Palermo, 2017; Olarte-Encabo, 2017). However, this phenomenon increased the differences between countries, regions, and social groups; it has also increased the gaps in the social structure (Bala & Singhal, 2018). The digital divide affects individuals in various social, political, cultural, technological, labor, cognitive and philosophical spheres (Olarte-Encabo, 2017). Furthermore, this phenomenon limits the fundamental right to education for groups in vulnerable conditions, such as women, indigenous people, people with disabilities, and students in precarious social sectors (Villela Cortés & Contreras Islas, 2021).

As a result, the digital divide restricts specific groups due to their physical or economic conditions, deficits in digital competencies and skills, and even social, cultural, or ethnic-racial barriers (Berrío-Zapata et al., 2017; Cabero-Almenara & Ruiz-Palermo, 2017; Ramírez-Castañeda & Sepúlveda-López, 2018). However, women are immersed in a specific digital divide, as there is a social inequality in the technological diffusion of ICT that fosters a disadvantage in women due to their role in occidental society. This phenomenon, called the Gender Digital Divide (GDD), is maximized, or minimized depending on the nationality, social class, race, access to education, qualification, age, and social position of women (Berrío-Zapata et al., 2017; Del-Valle-Gómez, 2020). Meanwhile, de Andrés del Campo et al. (2020) recognize the importance of identifying the delay women suffer in a) ICT access, b) use, and c) appropriation of ICTs in comparison to men.

Although there is a decrease in the GDD in access to ICT and the Internet, it is necessary to consider the lack of digital skills since the availability of ICT is not directly transferred through the use of these tools (Martínez-Cantos & Castaño, 2017). Moreover, several studies have shown differences between women and men in the use of ICTs and their relationship with technologies (Acosta Velázquez & Pedraza Amador, 2020; de Andrés del Campo et al., 2020; Rodríguez Ruiz & Agudo Prado, 2020). There is a significant difference between the percentage of men (55%) and women (48%) using the Internet in a global context; a higher difference in developing countries (men= 49% > women =40%). There is a parity score of 0.87 related to Internet use between men and women. However, the overall target requires a value of 1.00 (International Telecommunications Union, 2020).

Meanwhile, it coexists an evident GDD in the employment and entrepreneurship context because of barriers to women's digital skills (Acosta Velázquez & Pedraza Amador, 2020; Alozie & Akpan-Obong, 2017; Bala & Singhal, 2019). There is a direct impact on GDD because of gender differences in types of employment, as women are less likely to employ ICT in education, health, wellness, humanities, and the arts (Basco & Garnero, 2020). In addition, there are gender disparities that limit women's access to developing digital skills in their workplaces (Galperin & Arcidiacono, 2021).

It is worth mentioning that these gender inequalities in ICTs have existed for more than twenty years. Gender differences have been identified. There are differences related to a) the level of digital literacy (Arias-Fernandez et al., 2018), b) digital skills (Balagopal, 2020), c) the women's digital habits (Basco & Garnero, 2020), d) the lack of interesting content for women (Lagunes-Soto Ruiz, 2017), e) the insignificant women's participation in the information industry and f) their attitudes towards computer science (Gebhardt et al., 2019).

Nowadays, an important reduction of the GDD has been observed, mainly for the first level (access to technology). However, the second and third levels (effective use and appropriation of ICTs) require attention since a lower rate in the use and appropriation of ICTs by women is visualized (Galperín, 2017; Prendes-Espinosa et al., 2020; Rai, 2019). In the same way, Arroyo (2020), Eckert et al. (2018), Febro et al. (2020), García-Aguilera et al. (2021), Raman & Thannimalai (2019) recognize the importance of digital inclusion to reduce social and gender inequalities effectively. In this sense, this article attempts to analyze recent studies (2017-2021) that have addressed the issue of GDD and the digital inclusion of women in diverse fields from a global vision to identify current trends and requirements regarding the topic through the analysis and interpretation of a systematic mapping presented in three phases: 1) introduction, 2) method and report of results, 3) discussion and conclusions.

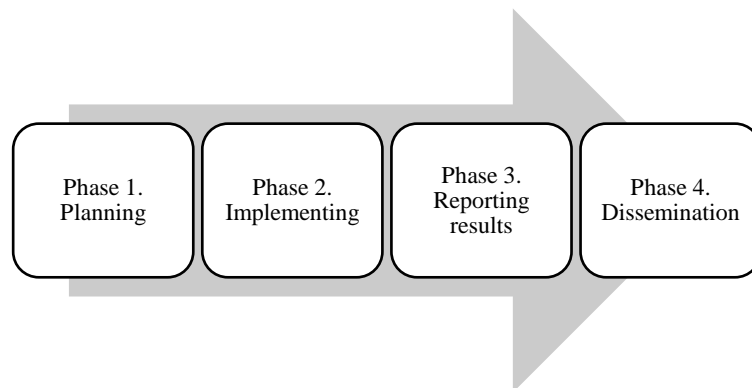
Methodology

This paper is a systematic mapping study of relevant research on GDD and women's digital inclusion by implementing a quantifiable analysis of seven databases from 2017 to 2021 to identify international research trends about GDD and women's digital inclusion through a collection and classification of the literature on the subject as various authors in other topics and areas of knowledge have previously performed (García-González & Ramírez-Montoya, 2019; George Reyes & Glasserman-Morales, 2021; Ruiz-Ramírez & Glasserman-Morales, 2021).

This methodological process, known as systematic mapping, is a previous step for a Systematic Literature Review based on the adaptation of the methodological approach of different authors (Petersen et al., 2008, 2015; Velásquez-Durán & Ramírez-Montoya, 2018) through a process of four phases (see Figure 1).

Figure 1

Systematic mapping process (based on Petersen et al. (2008), Petersen et al. (2015) and Velásquez-Durán and Ramírez-Montoya (2018)).



Phase 1: Planning

Phase 1 determined: a) definition of scope and objective, b) definition of research questions, c) definition of search strategies, d) definition of inclusion and exclusion criteria, e) refining research criteria based on Petersen et al. (2008) and Velásquez-Durán & Ramírez-Montoya (2018).

a) Definition of scope and objective

The objective of this study was to provide a comprehensive and current overview of academic research on the Gender Digital Divide and the Digital Inclusion of Women from 2017 to 2021. Additionally, it aims to identify and emphasize particular themes that require a more comprehensive analysis to enhance the understanding of this crucial topic in the current context. Papers in English and Spanish were considered because English is the international scientific language, and Spanish-language research is relevant in the context of Spanish-speaking countries.

b) Definition of research questions

The research questions were defined based on the objectives of the study and are presented in the following table:

Table 1
Research questions

Number	Questions
RQ1	How many studies have been published about the "Gender Digital Divide" and "digital inclusion of women" from 2017 to 2021?
RQ2	Which journals had the highest number of publications on the topic?

Number	Questions
RQ3	Which quartile do article journals have?
RQ4	How many documents have been published in open access?
RQ5	Where are the authors who publish on the topic from?
RQ6	What is the gender of the authors who publish on the subject?
RQ7	Where were studies located? And how many studies were found? Where is there a more outstanding academic production on the topic?
RQ8	Which institutions or organizations have published on this topic?
RQ9	In what research areas have the papers been published?
RQ10	What are the relevant subjects identified in the study topic?
RQ11	What are the most frequent keywords and concepts in the studies?

Source. Prepared by the authors.

c) Selection of search strategies

The strategy of literature search employed seven databases were used: *Dialnet, ERIC, Google Scholar, ProQuest, Scielo, Scopus, and Web of Science (WoS)* in order to have an updated understanding (from the last five years) of the topic and to visualize relevant and reliable information concerning the GDD, including studies in open and limited access. The document collection strategies included: a) search strings or keywords, b) search in databases, c) timeframe, d) type of document, e) languages, and f) study field, which are presented in Table 2.

Table 2

Search and strategy strings

Strategy	Description
Databases	Dialnet, ERIC, Google Scholar, ProQuest, Scielo, Scopus and WoS.
Search strings or keywords	“Brecha digital de género” AND “alfabetización digital”; “Brecha digital de género” AND “inclusión digital”; “Brecha digital de género” AND “habilidades digitales”; “Digital gender divide” AND “digital literacy”; “Digital gender divide” AND “digital inclusion”; “Digital gender divide” AND “digital skills”; “Digital gender gap” AND “digital literacy”; “Digital gender gap” AND “digital inclusion”; “Digital gender gap” AND “digital skills”
Timeframe	2017-2021
Type of document	Articles: a) research articles, b) popular science articles, c) data articles, d) systematic literature review articles, d) methodological articles. Meta-analysis

Strategy	Description
Language	Books
	Book chapters
Field of study	English
	Spanish
Type of document access	Education
	Sociology
	Multidisciplinary (Social sciences)
	Unspecified

Source. Prepared by the authors

d) Inclusion, exclusion, and quality criteria

The inclusion and exclusion criteria for the literature review considered: a) timeframe, b) types of documents, c) language, d) study fields, e) databases, f) duplicity of documents, and g) relevance for the topic. Moreover, quality criteria were established to analyze the documents as García-González & Ramírez-Montoya (2019) and Ruiz-Ramírez & Glasserman-Morales (2021); the criteria are shown in Table 3.

Table 3

Inclusion, exclusion, and quality criteria

Inclusion	Exclusion	Quality
Studies on the gender digital divide and digital inclusion of women in Dialnet, ERIC, Google Scholar, ProQuest, Scielo, Scopus and WoS.	Studies unrelated to the gender digital divide and digital inclusion of women.	Valuable contribution related to the topic of GDD and women’s digital inclusion. A valuable paper is established when gender criteria are identified in the research, or the main topic is based on the gender gap.
Articles, books, and book chapters published from 2017 to 2021.	Speeches, conference proceedings and policy papers.	Coherence between objective, method, and results.
Related articles, books, and book chapters in the fields of education, sociology, and multidisciplinary (social sciences).	Articles, books, and book chapters that do not belong to the period (2017-2021).	
Articles, books and book chapters in English and Spanish.	Articles, books, and book chapters which are not related to the fields of study of education, sociology, and multidisciplinary (social sciences).	
Articles, books, and book chapters in open or limited access.	Articles, books, and book chapters which are not in English or Spanish.	
	Duplicate articles, books, and book chapters from the same research.	

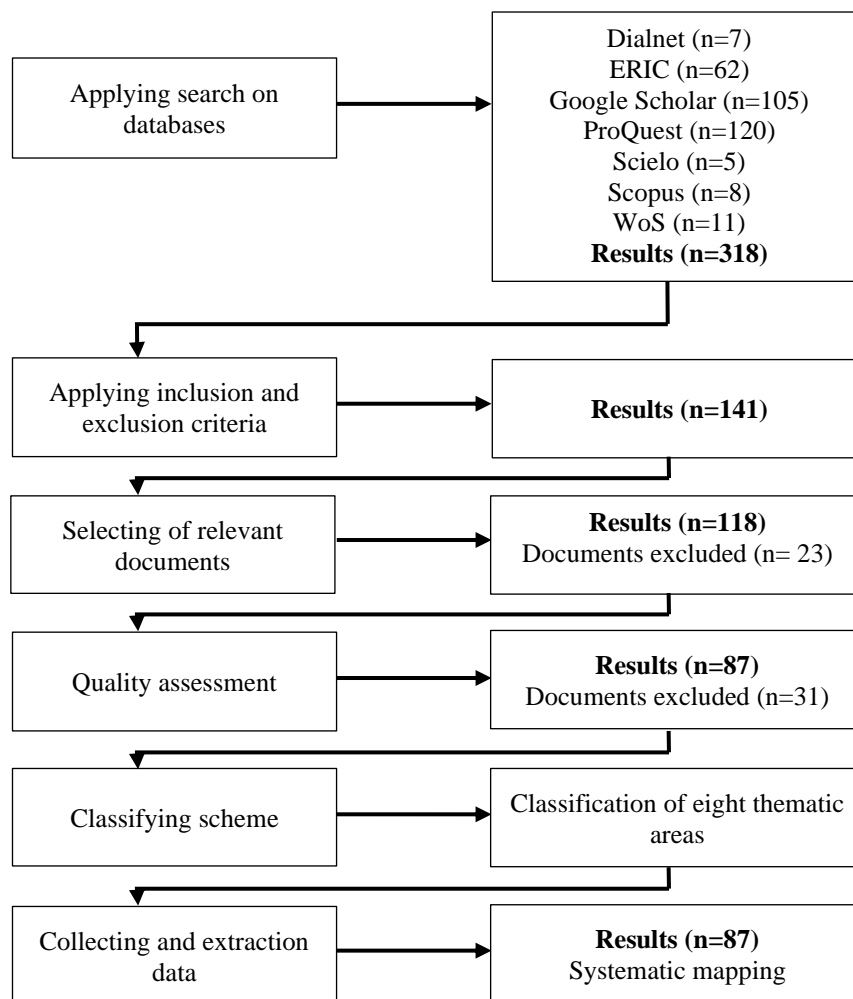
Source. Prepared by the authors.

Phase 2: Implementing

Implementing stage consists of carrying out the search strategies determined in the planning. Process steps included: a) searching the databases, b) applying inclusion and exclusion criteria, c) selecting relevant articles, d) quality assessment, e) classifying scheme, f) collecting data, and g) systematic mapping, as shown in the following scheme based on Petersen et al. (2008, 2015).

Figure 2

Systematic mapping development procedure. Prepared by the authors base on from Petersen et al. (2008) and Petersen et al. (2015)



a) Database extraction

The search extraction consisted of implementing the search and strategies strings defined in the planning. The first analysis through the seven databases: *Dialnet*, *ERIC*, *Google Scholar*, *ProQuest*, *Scielo*, *Scopus*, and *Web of Science (WoS)* followed the search criteria and filters depending on the possibilities of each database. At the end, a total of 318 documents were obtained from *Dialnet* (n=7), *ERIC* (n=62), *Google Scholar* (n=105), *ProQuest* (n=120), *Scielo* (n=5), *Scopus* (n=8) and *Web of Science (WoS)* (n=11) (see Figure 2).

b) Applying inclusion and exclusion criteria

The database (n=318) was first refined through the exclusion criteria. In addition, we validated the inclusion criteria established in the planning (see Table 3). The inclusion criteria were a) timeframe, b) types of documents, c) language, d) fields of study, e) databases, f) duplicity of documents, and g) relevant documents. At the end of the inclusion and exclusion criteria application, we limited the data (n=141) (see Figure 2).

c) Selecting relevant documents

After the first filter of inclusion and exclusion criteria, a second filter was performed to identify relevant documents considering: a) title screening, b) abstract reading, c) identifying keywords, and d) identifying subtopics in the database (n=141). At the end of the second filter, relevant documents were selected (n=118) (see Figure 2).

d) Quality assessment

To assess the quality of documents (n=118), we considered the quality criteria from the planning (see Table 3). Thus, the systematic mapping obtained 87 documents related to the genre or main topic (GDD) (see Figure 2).

e) Classifying scheme

Classification of the thematic areas was developed through literature review and analysis of the full papers in the database (n=87). The authors established eight categories to classify the papers. Table 4 presents the classification scheme by areas.

Table 4

Classification scheme

Number	Thematic area
1	Digital Literacy
2	Gender gaps, inequalities and/or differences
3	Digital competencies/skills
4	Formal education (pre-school, elementary, middle school, high school, or higher education)
5	Empowerment/work or professional development
6	Gender strategies/public policies
7	Digital and social inclusion
8	Technology Resources/Technology

Source. Prepared by the authors.

f) Collecting and extraction data

After refining the search, a bibliographic database was constructed using *Excel* software identifying the following fields: a) author(s), b) working title, c) year, d) document type, e)

journal or publisher, f) DOI, g) bibliographic data in APA format, h) abstracts, i) keywords, j) language, and k) access type. Access to the bibliographic database is available at the following link: cutt.ly/LTIXLm2.

g) Systematic mapping

Subsequently, a database was created with the document information to answer the research questions determined in the planning (see Table 1). There is a column to answer each of the ten questions of the study through an *Excel* sheet. The analysis of the results was performed through two types of software: a) *Tableau* (to visualize the data obtained from the questions [RQ1, RQ3, RQ4, RQ5, RQ6, and RQ7]), and b) *VOSViewer* (to obtain bibliometric networks and a visual grouping of the keywords and abstracts of the documents [RQ11]), according to the proposal of George-Reyes and Glasserman-Morales (2021). Access to the systematic mapping database can be found at the following link: cutt.ly/dTICxmg.

Phase 3: Reporting results

The report of the results is presented with a general structure that includes: 1) introduction and background of the GDD, as well as the importance of identifying recent research on the subject, 2) description of the planning and implementing process, 3) the results of the systematic mapping through the analysis and answering of each question established in the study (see Table 1), and 4) the discussion and conclusions. The document number was assigned according to the alphabetical order of the first authors in the bibliographic database (see [Systematic mapping database](#)).

RQ1 How many studies have been published about the "Gender Digital Divide" and "digital inclusion of women" from 2017 to 2021?

A total of 318 papers were initially located in seven databases: *Dialnet*, *ERIC*, *Google Scholar*, *ProQuest*, *Scielo*, *Scopus*, and *Web of Science (WoS)*. At the end of the implementation stage and applying the inclusion, exclusion, and quality criteria, we obtained a database of 87 documents. We created a table showing the document type and the number of studies in each year analyzed (2017-2021). It was observed that the years with the highest production of articles were 2020 (n=23) and 2018 (n=18). In the same way, the main production from 2017 to 2021 were articles (n=72), there was a minimal production of book chapters (n=7) and books (n=8) in the timeframe. On the other hand, the year with the lowest production of the topic was 2017 (n=7). We concluded that the total number of articles is 87 documents from 2017 to 2021, and the types of documents located in the databases are distributed in 72 articles, seven book chapters, and eight books (see Table 5).

Table 5*Distribution of documents per type of document and year*

Type of document	Year					Total
	2017	2018	2019	2020	2021	
Article	7	18	8	23	16	72
Book		2	3	3		8
Book chapters			2	3	2	7
Total	7	20	13	29	18	87

Source. Prepared by the authors.

RQ2 Which journals had the highest number of publications on the topic?

To answer this question, we only considered the articles (n=72), and we identified 64 journals that have published articles related to the topic. However, most of the journals have only published once (n=56). The few journals that have two publications related to GDD and digital inclusion of women from 2017 to 2021 are (a) *Comunicar* [36], [69], (b) *Economics* [21], [51], (c) *Humanities & Social Sciences Communications* [38], [41], (d) *Information Polity* [17], [48], (e) *Prisma Social: Journal of Social Research* [6], [82], (f) *Social Inclusion* [8], [20], (g) *Sustainability* [18], [43] and (h) *Temas laborales: Revista Andaluza de Trabajo y bienestar social* [53], [62]. Only eight journals have had an output higher than one study (see Table 6).

Table 6*Journal publications with the highest production on the subject*

Journal name and document number in database	Total publications
Communicate [36], [69]	2
Economics [21], [51]	2
Humanities & Social Sciences Communications [38], [41].	2
Information Polity [17], [48].	2
Prisma Social: revista de investigación social [6], [82].	2
Social Inclusion [8], [20].	2
Sustainability [18], [43]	2
Temas laborales: Revista andaluza de trabajo y bienestar social [53], [62].	2

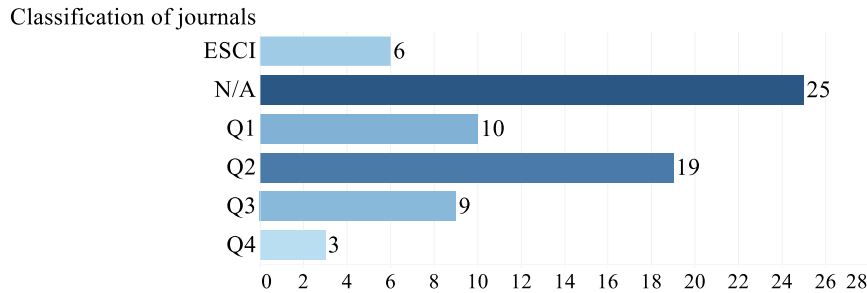
Source. Prepared by the authors

RQ3 Which quartile do article journals have?

We considered the 64 journals that published the 72 articles on the topic, excluding the eight books and seven book chapters. The journals were classified according to a) the quartile level (Q1, Q2, Q3, Q4) and b) ESCI (*Emerging Sources Citation Index*). Twenty-five journals were not classified (N/A) because of a lack of quartile level or emerging citation sources. Regarding the quartile level, the journals were mainly located at the Q2 level (n=19), while the Q4 level had the lowest number of journals in the classification (n=3). It is

recognized that a large number of journals could not be ranked in the quartile (n=25) (see Figure 3).

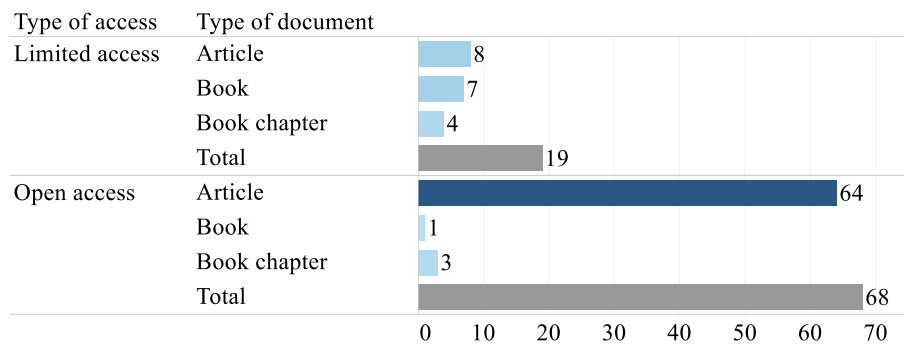
Figure 3
Classification of journals



RQ4 How many documents have been published in open access?

We analyzed the amount of published production in open access by classifying the documents (book, book chapter, and article) in open and limited access. It showed a higher production in open access (n=68) compared to limited access documents (n=19). There was a trend in publishing articles in open access during 2017-2021 (n=64) because there is a big difference with limited access articles in the same period (n=8). However, we recognized a lower production of books (n=1) and book chapters (n=3) in open access (see Figure 4).

Figure 4
Type of access

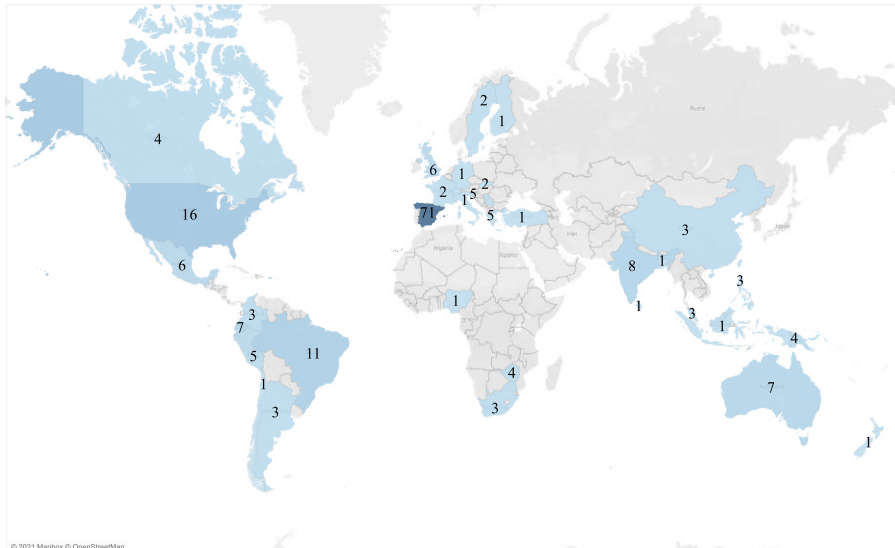


RQ5 Where are the authors who publish on the topic from?

A total of 203 authors were counted in the 87 papers collected since more than one author produces papers. However, specific authors contributed more than two papers on the subject during the period, such as Bala and Singhal [9], [10], Calderón [19], [20], Rebollo and Vico [81], [82], and Aneja contributed two papers [21], [51]. Therefore, a total of 197 authors were considered by eliminating duplicate authors since the main objective of this question was to recognize the location of the authors who investigated most in the subject. It was observed that the six countries with the highest number of authors are: 1) Spain (n=71), 2) the United

States (n=16), 3) Brazil (n=11), 4) India (n=8), and 5) Ecuador and Australia with the same number (n=7). Regarding the continents, a most homogeneous trend was visualized in Europe and America (see Figure 5).

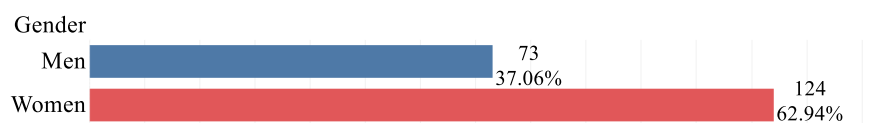
Figure 5
Geographical distribution of authors



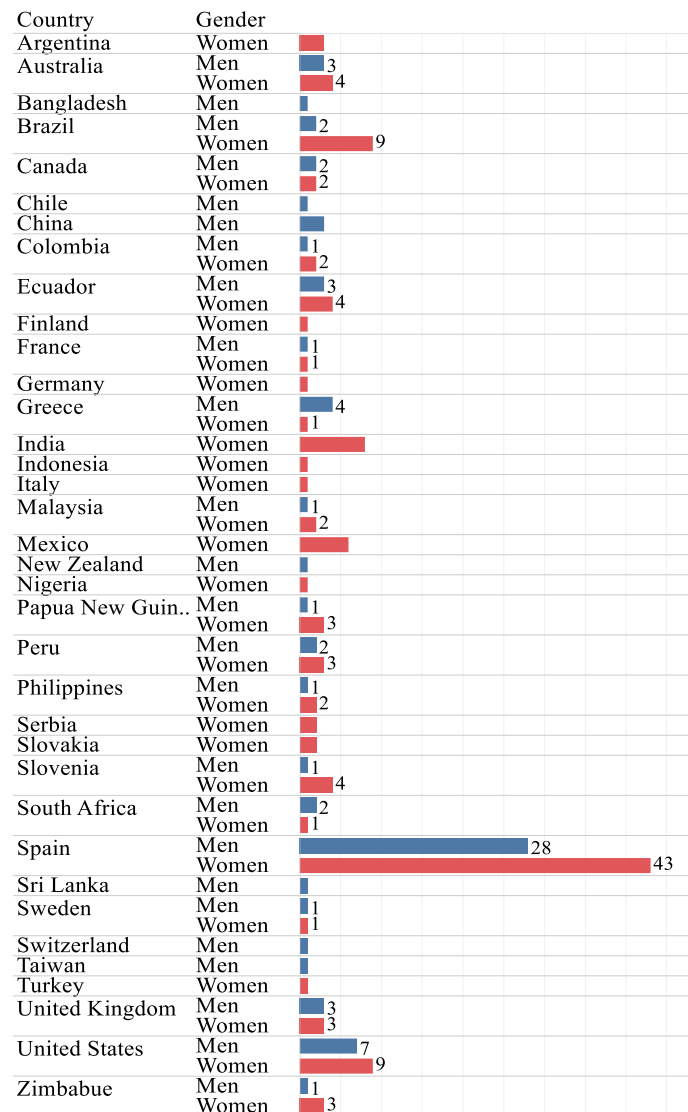
RQ6 What is the gender of the authors who publish on the subject?

The 197 number of the authors was classified between women and men to answer this question. It was observed that there is a higher production of the subject by women (62.94%) compared to men (37.06%). This figure reveals that women mainly studied the subject in a global context (see Figure 6).

Figure 6
Gender of authors



However, the number of authors by gender varies in each country. Therefore, a graphic chart was designed to show the authors' gender by country. As mentioned in the previous results, Spain has more authors focused on the topic, both men (n=28) and women (n=43). Countries such as Argentina, Finland, Germany, India, Indonesia, Italy, Mexico, Nigeria, Serbia, Slovakia, and Argentina have only women investigating the topic. In contrast, there are countries where the situation is the opposite of men studying the topic, such as Bangladesh, Chile, China, New Zealand, Switzerland, and Taiwan. Although the overall gender difference showed a more outstanding production of women on the topic, this production differs in each country (see Figure 7).

Figure 7*Country and gender of authors*

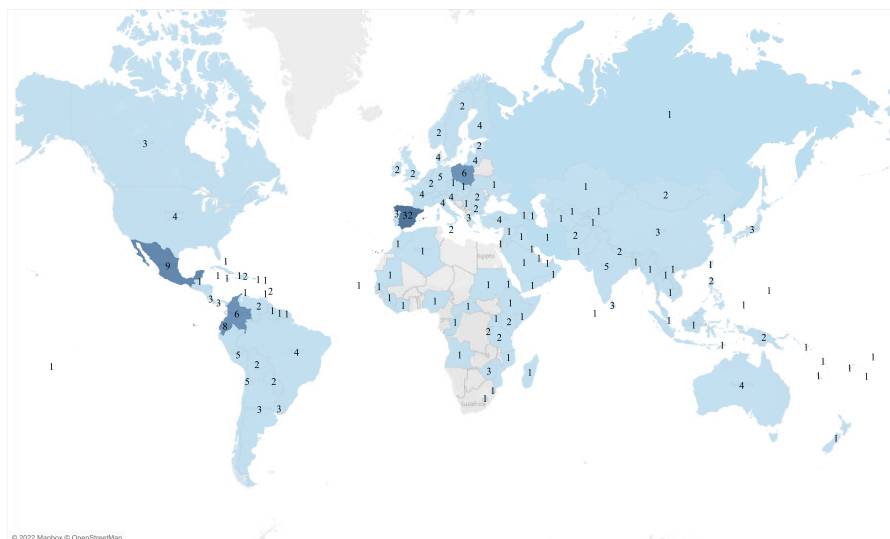
RQ7 Where were studies located? And how many studies were found? Where is there a more outstanding academic production on the topic?

To identify the countries where studies related to the topic were located, we counted the countries and regions through a geographic design where studies were counted. We should mention that there are studies that covered a global perspective (n=10) [7], [10], [21], [24], [47], [51], [57], [70], [85], and there are also studies that considered regions and groups of countries such as the Indo-Pacific Region [83], the Sub-Saharan Africa Region [4], the European Union [6], [66], South Asian countries [71] and Latin America [12], [56]. Moreover, there were productions that considered more than two countries [30], [36], [38], [44], [46], [55], [62], [66]. It was observed that Spain is the country with the largest number of studies related to the topic (n=32), with country-specific studies [5], [8], [15], [18], [19], [20], [22], [23], [25], [26], [27], [31], [33], [38], [52], [53], [60], [62], [63], [69], [74], [75], [77], [78], [81], [82], also studies shared with other countries [37], [43], [54], [65]; and

studies located in Europe. The second country was Mexico (n=9) with studies in the country [1], [46], [64]; studies conducted with other countries [32], [37], [65] and studies located in Latin America [12], [56] and the Indo-Pacific Region [83]. The third country was Ecuador (n=8) with studies focused on the country [34], [58], [76]; studies in Latin America [12], [56] and the Indo-Pacific Region [83], as well as studies with other countries [32], [65]. Colombia and Poland are in the fourth position with the same production (n=6). We counted studies in Latin America [12], [56] and the Indo-Pacific Region [83], studies developed in the country [73] and studies with other countries [54], [65] to Colombia. Poland had studies with other countries [29], [35], [37], [45] and studies in the European Union [6], [66] (see Figure 8).

Figure 8

Geographical distribution of studies on the subject



RQ8 Which institutions or organizations have published on this topic?

There were 140 institutions and organizations with at least one product on this topic. However, about 117 had a single production during the period. For this reason, a table was made with the nine universities with more than one contribution on the topic. The University of Seville (n=4) and the Complutense University of Madrid (n=4) were in the first place. The University of Granada (n=3), the Open University of Catalonia (n=3), and the University of Castilla-La Mancha (n=3) were in the second position. Finally, the University of Salamanca (n=2), the University of Valladolid (n=2), the University of Vigo (n=2), and the V.V. Giri National Labour Institute (n=2) are in the third position. We visualized eight universities with the highest production in Spain and an institute located in India (the V.V. Giri National Labour Institute) (see Table 7).

Table 7*Universities and organizations with the highest production on the topic*

Universities and organizations	Number of documents	Number of productions
University of Seville	[25], [74], [81], [82]	4
Complutense University of Madrid	[6], [19], [20], [52]	4
University of Granada	[62], [75], [78]	3
Open University of Catalonia	[8], [38], [52]	3
University of Castilla-La Mancha	[6], [31], [63]	3
University of Salamanca	[15], [18]	2
University of Valladolid	[5], [24]	2
University of Vigo	[27], [53]	2
V.V. Giri national Labour Institute	[9], [10]	2

Source. Prepared by the authors**RQ9 In what research areas have the papers been published?**

The papers were located in three research areas: a) Multidisciplinary (Social Sciences) (n=39) (44.82%), b) Education (n=34) (39.08%) and c) Sociology (n=14) (16.09%). We concluded that the research area with the highest production was Multidisciplinary (Social Sciences). The area with the lowest production was Sociology through the data of the documents and the classification of the research areas established in the planning (see Table 8).

Table 8*Classification of documents by research areas*

Research area	Document number in database
Multidisciplinary (Social Sciences) (n=39) (44.82%)	[1], [2], [3], [4], [7], [8], [9], [10], [11], [12], [17], [19], [20], [21], [22], [27], [31], [32], [36], [38], [41], [43], [45], [47], [48], [51], [52], [56], [57], [58], [59], [60], [64], [67], [70], [73], [74], [82], [83]
Education (n=34) (39.08%)	[15], [16], [18], [23], [25], [28], [29], [30], [33], [34], [35], [37], [40], [42], [44], [49], [50], [55], [61], [63], [65], [68], [69], [72], [75], [76], [78], [79], [80], [81], [84], [85], [86], [87]
Sociology (n=14) (16.09%)	[5], [6], [13], [14], [24], [26], [39], [46], [53], [54], [62], [66], [71], [77]

Source. Prepared by the authors**RQ10 What are the relevant subjects identified in the study topic?**

Based on the classifying scheme previously elaborated, the main thematic subjects related to the topic were identified. Gender Gap, inequalities, and/or differences (n=24) (27.58%) was identified as the topic mentioned most frequently in the documents. The second position

was divided into two topics: a) Digital and social inclusion (n=13) (14.94%) and b) Formal education (pre-school, elementary, middle school, high school, or higher education) (n=13) (14.94%). Empowerment/work or professional development is in the third place (n=12) (13.79%). It is recognized that the themes of Gender strategies and/or public policies (n=5) (5.74%) and Technological resources/Technology (n=3) (3.44%) were the least addressed in the documents (see Table 9).

Table 9

Classification of documents by subject area

Subject area	Document number in database
1. Digital Literacy (n=8) (9.19%)	[15], [33], [36], [49], [68], [80], [81], [85]
2. Gender gaps, inequalities and/or differences (n=24) (27.58%)	[4], [5], [6], [9], [12], [13], [14], [23], [24], [26], [27], [31], [35], [40], [43], [45], [53], [54], [62], [64], [66], [71], [84], [86]
3. Digital skills/competencies (n=9) (10.34%)	[3], [16], [18], [44], [50], [65], [77], [78], [79]
4. Formal education (pre-school, elementary, middle school, high school, or higher education) (n=13) (14.94%)	[10], [25], [28], [29], [34], [37], [42], [55], [61], [63], [69], [76], [87]
5. Empowerment/work or professional development (n=12) (13.79%)	[1], [2], [7], [32], [38], [47], [52], [59], [60], [67], [72], [83]
6. Gender strategies and/or public policies (n=5) (5.74%)	[17], [48], [56], [74], [82]
7. Digital and social inclusion (n=13) (14.94%)	[8], [11], [19], [20], [21], [22], [39], [41], [46], [51], [57], [58], [70]
8. Technological Resources/Technology (n=3) (3.44%)	[30], [73], [75]

Source. Prepared by the authors.

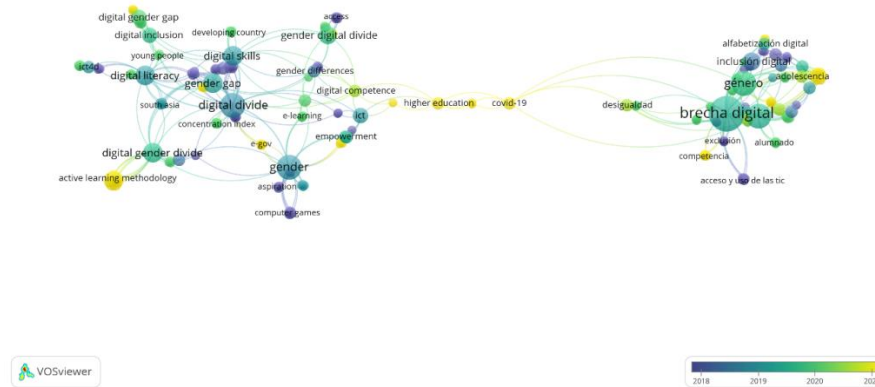
RQ11 What are the most frequent keywords and concepts in the studies?

We constructed bibliometric networks to analyze a) the keywords and b) the titles and abstracts of the papers through *VOSViewer*. A co-occurring analysis with a full count method was selected to visualize the underlying keyword relationships, and all 245 keywords in the documents were considered without power delimitation. The bibliometric network map of the keywords of the GDD and the digital inclusion of women confirms the key concepts regarding the topic and the years with the highest production since the predominant concepts in the map are purple (2018) and green (2020). Likewise, the terms with the highest relevance are observed: *brecha digital*, *digital divide*, *género*, *gender*, *gender gap*, *gender digital divide*, *digital gender divide*, *digital literacy*, *alfabetización digital*, *inclusión digital*, and *digital inclusion*. However, the most relevant concepts were *covid-19*, *adolescencia*, *higher*

education, and *active learning methodology* in 2021. In fact, the most relevant topics is related to the covid-19 pandemic and studies in higher education and adolescents in the previous year (see Figure 9).

Figure 9

Bibliometric network map of keywords



Similarly, the most recurrent terms can be observed in the database map of the titles and abstracts of the 87 papers. The complete count generated 2454 total terms; we selected the terms with a minimum occurrence of 10. The result was 20 terms that were manually checked to eliminate connectors, prepositions, and grammatical articles. Three groups are observed that intertwine among the terms. The first group (red) shows a relationship between the terms *access*, *data*, *digital divide*, *gender gap*, *use*, and *woman*. The second group (green) shows eight related terms: *communication technology*, *digital skill*, *education*, *gender*, *ICT*, *information*, *student*, and *study*. Finally, the third group shows a relationship between three terms: *género*, *internet* and *TIC* (gender, internet, and ICT) (see Figure 10).

Figure 10

Network map of titles and abstracts



Discussion and Conclusions

The research on GDD and the digital inclusion of women allowed the analysis to identify current trends and requirements on the subject. The findings of the study recognized:

- The production related to the topic (n=87) is lower than other topics such as a) scientific production in open innovation (n=104) proposed by García-González and Ramírez-Montoya (2019) or quality assurance (n=154) referred by Ruiz-Ramirez and Glasserman-Morales (2021). However, there is more production than technology-mediated research competencies (n=76) (George Reyes & Glasserman-Morales, 2021). We recognized the need of studies focused on this topic in the coming years. Furthermore, it was also visualized that the production related to the topic has not been constant and has not increased considerably in this period, since the highest production was in 2018 and 2020 while the production in 2021 has not still reached the studies for the previous years. Thus, constant and increasing scientific attention is required concerning the topic in subsequent years.

- It is recognized that publications related to the topic are scattered since only eight journals had two publications on the topic, while the other journals addressed the topic once during the five years analyzed. The identified production was insufficient and inconsistent during the period. Therefore, greater attention is required to this complex and multidimensional phenomenon that limits women (Berrío-Zapata et al., 2017; Ramírez-Castañeda & Sepúlveda-López, 2018). In addition, it is required to evaluate the social repercussions of women in the digital world (Bikos et al., 2018).

- There is a positive trend of production with open access regarding the topic (n=68) since documents with limited access restrict the dissemination of the few studies. There is a call to continue open access production to promote women's digital inclusion and reduce GDD since social and educational attention to the topic is required (Chetty et al., 2018; Gulzar & Fayaz, 2018; Kerras et al., 2020; Mallawaarachchi, 2019).

- We recognize a significant predominance of Spanish authors focusing on the topic, both men and women. There is a considerable reduction in production from authors in other countries. Thus, it is necessary to have more researchers investigating the topic. It is also important to mention that the results revealed no direct gender pattern since there were countries where only men talked about the topic. Although there is an overall trend of women researching the topic, this pattern is not homogeneous. Thus, there is an interest of both men and women to analyze this current phenomenon that produces gender disparities in multiple areas (Galperin & Arcidiacono, 2021; Meneses-Cabrera & Aranda-Bustamante, 2020; Pedraza Bucio, 2021; Rodríguez Ruiz & Agudo Prado, 2020; Vico-Bosch & Rebollo-Catalán, 2018).

- It was identified that Spain is the only country where the studies and authors are linked. However, some authors investigated more than their own countries since ten studies analyzed the topic from a global perspective. Moreover, region studies such as Latin America, the European Union, and the Indo-Pacific region showed more studies than the authors' countries (see Figures 5 and 8). Thus, global and regional studies give certain indications regarding the subject in countries where there are no local studies on the subject.

- There is a tendency to analyze the subject in the social sciences and multidisciplinary fields. Furthermore, there is a considerable number of studies in the field of Education to decrease the GDD (Galperin & Arcidiacono, 2021; Mariscal et al., 2019; Palomares-Ruiz et al., 2021; Pérez-Escoda et al., 2021; Porubčinová & Novotná, 2020) and women's empowerment and their digital inclusion (Borham-Puyal, 2019; Mare, 2021; Martínez-Cantos & Castaño, 2017; Muñoz-Aroca et al., 2018; Watson et al., 2018).

- Current studies on GDD have identified the gender gap, inequalities, and differences as the main theme. Thus, it is recognized that this phenomenon can be exacerbated depending on the social, economic, educational, and generational differences in women's scenarios, such as education, work, society, and culture (Berrío-Zapata et al., 2017; Larsson & Viitaoja, 2020; Macaya et al., 2021). It was observed that several studies managed to identify the differences in access, use and benefit of ICT between women and men (Acosta Velázquez & Pedraza Amador, 2020; Bradić-Martinović & Banović, 2018; Cussó-Calabuig et al., 2017; de Andrés del Campo et al., 2020; Perifanou & Economides, 2020; Rodríguez Ruiz & Agudo Prado, 2020; Yong, 2017).

- Concrete examples were found that show how the GDD can differ based on location and personal circumstances. These examples support the idea that the GDD can vary, which was previously stated by Ramírez-Castañeda and Sepúlveda-López (2018). An example of digital skills and confidence variability between genders was found in Yong's study (2017), particularly among those considered digital natives. On the other hand, the work of Watson et al. (2018) examined the workplace environment in the Indo-Pacific region. It demonstrated the persistence of barriers that limit women's full exploitation of the benefits of the digital economy. According to Rai (2019), women in South Asia continue to face obstacles in achieving gender equality and participating in decision-making, even within their families. This highlights the importance of promoting and supporting women's presence in the digital world. Perifanou and Economides (2020) found that men have better digital skills than women in fields like education, employment, career advancement and entrepreneurship, highlighting the Gender Digital Divide in Europe.

According to the study's objective to identify international research trends concerning GDD and women's digital inclusion, it is concluded that international interest in research on this topic is still limited and requires more attention. It is recognized that studies mainly focused on women's differences and inequalities in various fields. Although there are studies related to women's digital literacy and digital competencies/skills, it is recommended to focus on studies to minimize the GDD.

Likewise, several studies mainly analyzed and evaluated public policies and gender strategies promoted by the government, since the production related to this topic is minimal, as well as the analysis of technological resources and technology which can support the eradication of the GDD. This study identified the necessity of analyzing public policies that promote access to ICTs for women in different regions of the world and conducting studies that validate the use and benefits of ICTs through current technological resources.

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