

Research on Virtual Education, Inclusion, and Diversity A Systematic Review of Scientific Publications (2007–2017)

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Article abstract

This article covers a topic related to increases in the existing heterogeneity of the university student population, specifically in virtual learning environments. There is a growing concern for offering training alternatives that include all students. As the first step in a line of research related to quality, equity, and inclusion in e-learning, we aim to identify emerging trends in research on inclusive virtual education (IVE) at the higher education level and how inclusion is conceptualized. Our goal is to provide ideas on future research topics and raise issues for further exploration. This research was conducted through a systematic review of articles published in the last decade in the WOS and Scopus databases. Upon reflection, we suggest the need for inclusive e-learning educational designs with greater emphasis on human diversity in all of its complexity. By doing so, we may be able to contribute to increasing the equality of educational opportunities and overcoming the barriers that restrict the access, continuity, and successful exit of the entire student population, regardless of their individual learning needs.

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December – 2019

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Abstract

This article covers a topic related to increases in the existing heterogeneity of the university student population, specifically in virtual learning environments. There is a growing concern for offering training alternatives that include all students. As the first step in a line of research related to quality, equity, and inclusion in e-learning, we aim to identify emerging trends in research on inclusive virtual education (IVE) at the higher education level and how inclusion is conceptualized. Our goal is to provide ideas on future research topics and raise issues for further exploration. This research was conducted through a systematic review of articles published in the last decade in the WOS and Scopus databases. Upon reflection, we suggest the need for inclusive e-learning educational designs with greater emphasis on human diversity in all of its complexity. By doing so, we may be able to contribute to increasing the equality of educational opportunities and overcoming the barriers that restrict the access, continuity, and successful exit of the entire student population, regardless of their individual learning needs.

Keywords: inclusive e-learning, inclusive Web design, e-learning and accessibility, inclusive virtual education

Introduction and Background

As one of the biggest challenges in education today, attention to student diversity is an important part of academic discussion. The issue was included in the UNESCO goals to be met by 2020 and is still a central focus in the 2030 education goals, as part of Sustainable Development Goal 4 to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (UNESCO, 2015, p.6).

Since this requirement also extends to virtual education, it is necessary to specify and describe some concepts on which this study of inclusive virtual education (IVE) is based. We begin with the principles that govern educational designs that aim to address the diversity of the student body, seen as the core of inclusive education. In addition, we will provide a conceptual explanation of some terms that we will use regularly, such as diversity and differences. This will allow us to contextualize our view of inclusive education, and will make our perspective clear.

When discussing inclusive education, we inevitably come across a series of principles that regulate how to handle the diversity of students from the perspective of education as a human right. Thus, we find principles such as tolerance, respect, educational equity, accessibility, quality, social justice, and inclusion, in accordance with the concept of equal educational opportunity (EEO), and even though debating these principles is not the goal of this article, since the concept of EEO implies a very broad perspective, based on multiple dimensions from different disciplines, it is necessary to mention these principles as they are involved in our vision of inclusive education.

It is also important to clarify our view of diversity as an intrinsic property of the human condition. This diversity is evident in the differences, which, according to Sánchez and Pulido (2007), “are not intrinsic, neither objective, nor *a priori*, but dominant social constructions that produce certain mental outlines, and are produced by them” (p.16). Thus, we can see how diversity, being an abstract property, cannot be seen by the human eye, while the differences may be seen.

These statements about diversity and human differences, suggest a grouping of types of differences proposed by Fermín (2011), who considered different classifications introduced by various authors. These classifications are merely didactic in nature, and help make human differences clearly visible. The author proposes four large groups of differences which allow us to characterize human diversity, understanding that they are not mutually exclusive. They include:

- biological and/or physical differences, including age, gender, biological rhythms, and state of health;
- cultural and/or racial differences, such as different cultures, social classes, ethnic groups, and races;
- learning differences, to address cognitive and learning styles, as well as different learning abilities; and
- personal differences, such as personality and socio-affective characteristics (Fermín, 2011, p.28).

It is worth noting that this is not a closed set of groups, nor is it completely exhaustive. It is an approach to visualizing human differences that should be addressed with various educational designs, and for the issue that concerns us, that of developing IVE, which deals with learner differences in all of their complexities. An emerging category of analysis, that surfaced from the analysis carried out by us, refers to a vision of IVE that is focused on other human differences, distinguished from that focused on persons with disabilities.

This brief discussion of the concepts of diversity, difference, and inclusion supports the notion that this study seeks to highlight: all of the human differences that make diversity perceptible. Therefore, we considered it convenient to include a brief discussion on this matter, as well as to highlight how it is linked to inclusive education, as a thematically interesting epistemological approach.

Likewise, we also wish to first clarify our conceptualization regarding inclusive education, and then deal with IVE. Although there does not seem to be an agreed-upon definition in the academic community, inclusive education is linked to the idea that absolutely all students have the right to be recognized in their uniqueness. It is their right to be accepted, to be valued, and above all, to have equal opportunities to participate, according to their abilities and talents, in order to achieve the maximum development of each one's potential. According to some authors (Echeíta, Simón, López, & Urbina, 2013; UNESCO, 2001), the inclusive education approach, with its emphasis on students with disabilities, is still present in some countries. However, progress has already been made in recognizing the complexity that characterizes human diversity, in which inclusive education is considered a reform that responds to diversity among all students. Three key ideas make up this conceptual space. Inclusive schools are those that: (a) train everyone for and in diversity; (b) do not address the needs of a minority, but keep the entire student population in view; and (c) entail a paradigm shift, which implies a different way of understanding education and society.

As may be seen, inclusive education is not limited to curricular or methodological adjustment, or to restructuring special education. It is a different way of understanding education, a new paradigm that reflects a new philosophy and values (Colás-Bravo & Lozano, 2011), and that also views education as positive and a right for all people (Echeíta & Ainscow, 2011). In addition, as a constant innovation and improvement process, it demands optimization of conditions, resources, and the supports that serve as process facilitators (Echeíta et al., 2013). Once inclusive education truly comes into existence, it will have direct implications for society, reflected in true social inclusion.

Based on this premise, we examine how virtual education fits within this approach and consider ways to consolidate the e-learning modality under the inclusive paradigm. Creating a foundation on which to build IVE involves everything indicated in inclusive education, within the modality of virtual teaching and learning. From this premise and set of assumptions, we developed a conceptual approach based on our results found, which will be detailed in the corresponding section.

Research Problem

In the field of virtual education, practices that seek to combat segregation and exclusion have been developed, based on inclusive educational designs for the world of e-learning. Therefore, it is relevant to

explore these practices, to determine the concept of inclusion on which they have been proposed, and the audience they have been designed for.

To answer these questions, we set out to conduct a systematic review of research related to IVE at the university level: What inclusive e-learning educational designs exist today? How do they describe and explain the idea of inclusion? How do they conceptualize IVE? Do they recognize all of the complexity that characterizes human diversity in inclusion? The goal of our research was to identify the emerging trends in higher education IVE research and its conceptualization of inclusion, and to provide ideas to other researchers on future research topics, as well as issues for further exploration. In order to accomplish this, we conducted a systematic review of articles published in the last decade.

Research Method

This article presents exploratory research, through which we studied the research trends of IVE in higher education. The documented bibliography describes an extensive, systematic review of the literature regarding IVE in higher education, based on articles published in scientific journals indexed in Web of Science (WOS) and Scopus during the period of 2007 to 2017.

We used data collection techniques and instruments designed (a) to guarantee the systematicity of, and the veracity of the information presented, (b) to show how the evidence justifies the results that are presented, and (c) to offer contributions to help us better understand the phenomenon being studied.

The review was conducted as a systematic process of searching for, collecting, organizing, and analyzing information from a clearly formulated question, as well as implementing explicit methods to critically identify, select, evaluate, compile, and analyze the data from the studies included in the review according to certain criteria (Krull & Duarte, 2017). This review was conducted considering the seven steps suggested by Cooper (2010), as cited in Krull & Duarte (2017, p.4):

1. Draft the research problem.
2. Search the literature.
3. Gather information from the studies.
4. Assess the quality of the studies.
5. Analyze and integrate the results of the research.
6. Interpret the evidence.
7. Present the results.

It is important to note that these steps are not exclusive or rigid, but are part of a continuous process. Since we have already discussed the first step, we will now describe the remaining steps in detail.

In terms of reviewing the literature, we decided to look for research that would address IVE at the university level in the last decade (2007–2017), in the Scopus and WOS databases. The following search descriptors were established: (a) inclusive e-learning, (b) inclusive e-learning accessibility, and (c) inclusive e-learning diversity. Next, inclusion and exclusion criteria were established to select the publications to be analyzed.

The inclusion criteria ensured that the studies: (a) responded to the search descriptors, (b) addressed higher education, and (c) consisted of research published between 2007 and 2017. Initially, we considered using only articles in peer-reviewed journals; however, in view of the valuable results provided by other publications in the Scopus and WOS databases, published articles, books, book chapters, and speeches were included. Finally, our review included only articles for which the full text was available publicly or through the researchers' institutional subscription.

Two exclusion criteria were considered. First, we excluded research related to an educational level that was different from university or that came from other fields of study, or social realms. Second, we excluded research that addressed inclusive education that was not in a virtual university education context, or if it did address virtual university education, it did not consider the inclusive education approach.

The first search based on the descriptors yielded 34 articles reported in WOS and 309 in Scopus. Then, the aforementioned criteria were applied to this total of 343 publications. Studies repeated in both databases were eliminated, leaving a total of 89 publications for analysis.

The next two steps addressed collecting and assessing the quality of information, and they complemented each other. In the first instance, a protocol was developed to organize the relevant information from the articles according to the criteria of authorship, publication date, title, journal or publication medium, and abstract. This information is presented in a matrix (see matrix on <https://sites.google.com/view/elearning-inclusive-research/página-principal>). As for quality, since the studies in these two databases are subject to peer review, we presume that this guarantees the accuracy and quality of the studies.

The next steps of analysis, interpretation, and presentation of research results will be explained in the following sections.

Results and Research Analysis

For the purposes of this study, content analysis was carried out in order to organize, analyze, and interpret information. Cáceres (2003) suggested the following steps for this type of analysis: (a) select the object of analysis; (b) conduct a pre-analysis to consider prior research and determine the unit of analysis (in our case, the publications that met the established criteria); and (c) code, categorize (to ensure the reliability of this step). These steps were developed by following Glaser and Strauss (1967), with the constant comparative method (CCM).

To analyze the data that arose from the review, two qualitative research tools were used—the CCM, as a theoretical and practical tool, and ATLAS.ti, a tool of a more purely practical nature. These complementary tools helped us structure an analytical process of high methodological quality, which enabled us to construct conceptual networks based on the categories and subcategories that arose from the 89 studies analyzed.

Four phases must be addressed during the analytical process. Due to the exploratory scope of our study, we used the first three phases: (a) initial review and selection; (b) categories, codes, and groupings (open coding); and finally, (c) integration, description, and interpretation (axial coding). The process was inductive, a characteristic of content analysis and, although data was allowed to surface during the analytical process, the focus of analysis was guided by our research questions. Fundamentally, our interest was in knowing how inclusive education has been understood, since this determines the type of educational design that is offered. Figure 1 shows the first conceptual network, illustrates the central category and how it is connected to the other elements.

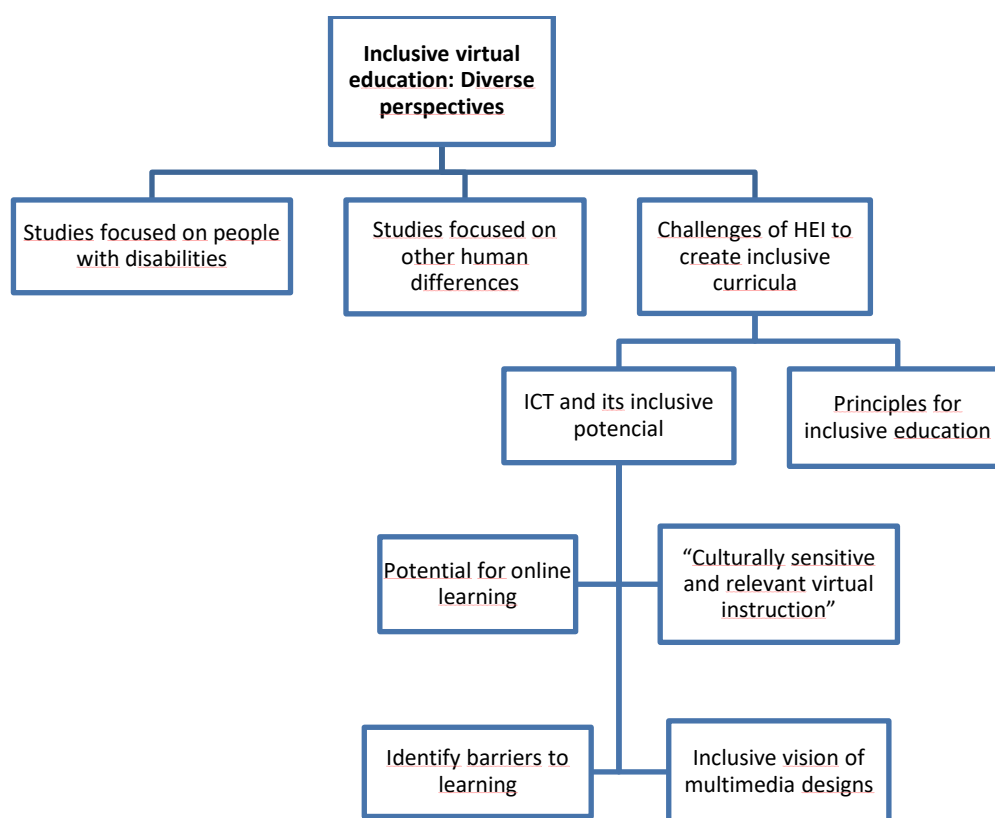


Figure 1. Main elements of inclusive virtual education with central category highlighted. This mind map illustrates the categorization process, including the central category and its subcategories. The text within quotation marks corresponds to the codes "in vivo," i.e., to an expression taken textually from the articles reviewed, while the others are constructions or conceptual codes generated by the researcher during the analysis process.

As Figure 1 illustrates, IVE is a complex process involving different perspectives. Three major categories are evident and may be defined as: (a) focused on other human differences; (b) focused on people with disabilities; and (c) challenges of higher education institutions (HEI) to create inclusive curricula. Of the 89 studies analyzed, 51 (57.3%) focused on people with disabilities, while 38 studies (42.7%) addressed IVE educational designs for other human differences. Having this been identified, we did not intend to determine whether or not any of the approaches were appropriate or not, but rather to simply question the relevance of continuing to develop educational designs that address a single type of human difference. The current student reality is highly complex and diverse, and requires the development of educational designs that may address this complexity while also considering the students' individualities. Similarly, this analysis helped us appreciate the many challenges facing HEI as they respond to student diversity by designing inclusive curricula.

Studies Focused on People With Disabilities

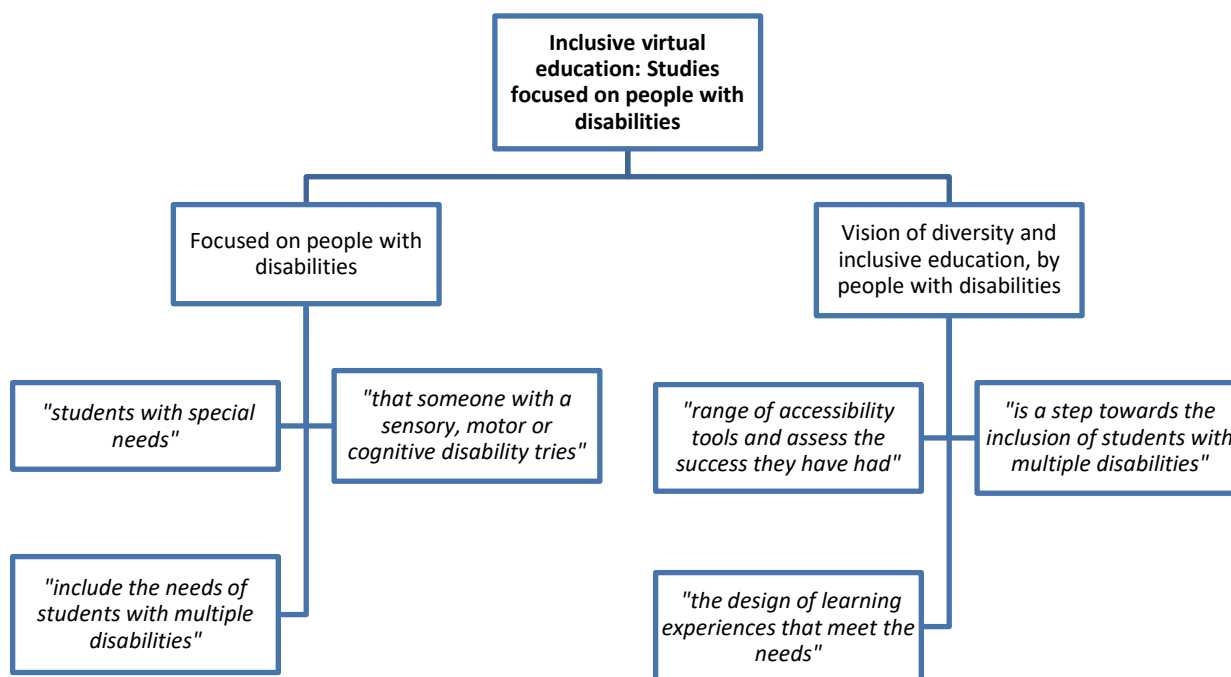


Figure 2. Studies focused on people with disabilities. This mind map illustrates the subcategory and its properties. Regarding the properties, some of the text is framed in quotation marks and italics, which correspond to brief textual quotations of some of the articles studied.

Figure 2 illustrates that the studies address different types of disabilities, including: (a) sensory, (b) motor, (c) cognitive, (d) multiple, and (e) dyslexia or other types of learning difficulties. The various pedagogical

approaches for inclusion to meet the requirements of these students are essentially accessibility educational designs to develop virtual learning environments that allow this population to overcome the different barriers related to their limitations (Amado-Salvatierra & Hilera, 2015). Such designs suggest: (a) the use of assistive technology, (b) the development of accessible e-learning materials and activities, (c) curricular designs of accessible content, (d) the development of metacognitive processes to motivate learners through ICT, and (e) other adaptations to facilitate learners' access to knowledge. Most of the studies analyzed in this research focused on the inclusion of people with disabilities. Some dealt with actions aimed exclusively at students, while others indicated an understanding that the inclusion of people with disabilities does not depend exclusively on assistive technologies; these learners are also helped when programs train teachers to handle appropriate strategies to meet students' needs, and Web developers to design software that meet the technical criteria which is used to develop inclusive platforms, and that are dealt with below. These efforts make it possible to address this educational challenge of caring for people with disabilities more broadly, as they do not assume that guaranteeing access alone is a sufficient measure. Strategies must allow for all students to continue in the program (continuity) and to successfully complete it, regardless of their personal differences; this requires the development of institutional programs that focus on students with disabilities, as well as their peers, teachers, and all of the assistive technology that has been developed in recent decades (Fermín, 2013).

As researchers in this field, we value the effort in developing virtual learning platforms that allow students with disabilities to navigate autonomously, in an approachable manner, and where their opportunities to interact with resources and other key actors in the learning process are facilitated. However, we know that, at present, this is insufficient. Thus, especially in recent years, inclusive e-learning educational designs are being developed in which other human differences are recognized.

Studies Focused on Other Human Differences

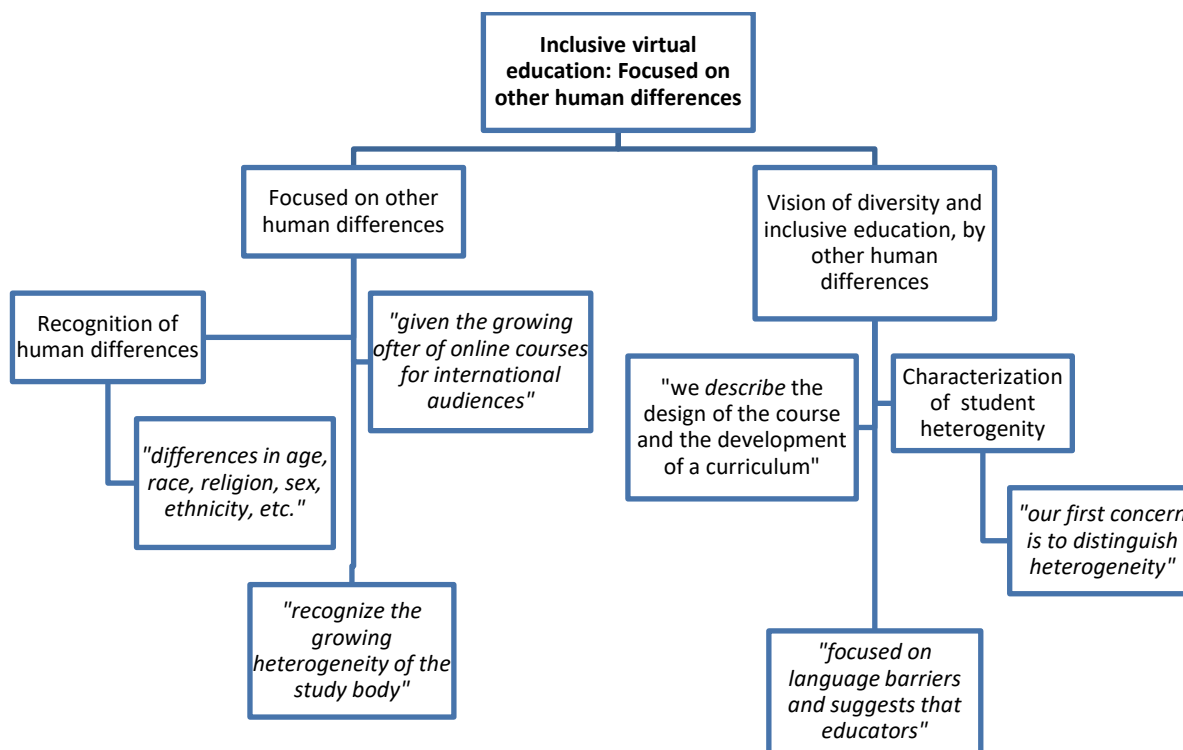


Figure 3. Focused on other human differences. This mind map illustrates the subcategory and its properties. Regarding the properties, some of the text is framed in quotation marks and italics, which correspond to brief textual quotations of some of the articles studied.

Figure 3 shows that the studies reviewed for this research explicitly recognized other human differences, such as (a) age, (b) race, (c) religion, (d) gender, (e) ethnicity, (f) culture, and (g) social status. There is clearly a need to characterize growing student heterogeneity, in terms of making it visible, as the only possible mechanism for developing educational designs that allow these students to appropriately meet their needs (e.g., those who speak another language or come from other cultural contexts). In developing an IVE educational design, it is assumed that learning must be accessible to all, under the principle of inclusive universal access. In developing concrete strategies, it is clear that the principles of the universal design for learning (UDL) and how it is applied in an e-learning environment are linked (Al-Azawei, Parslow, & Lundqvist, 2017).

Moreira (2016) reflected on the impact of online education, given the increased numbers of students, and, consequently, the presence of students' diversity in online classes. Different types or forms of reasoning need to be developed within a student body with differences in terms of: (a) education, (b) culture, (c) rationality, (d) learning styles, (e) age, (f) race, (g) nationality, (h) expectations, and (i) demands. In recent years, as more online courses are offered for international audiences, the number of learners studying online has also increased and a more diverse student population has resulted from this. In this systematic review, we examined various studies that offer alternatives to address this educational challenge; most of

them focused on understanding a particular educational phenomenon—to discover what is happening, who the students are, and to highlight the diversity of the student population. Some also questioned which of the barriers they encounter are in their learning process, and how these could be addressed. It is not the purpose of this study to determine the pertinence (or lack) of the strategies developed. However, it opens a line of research that could systematize strategies or approaches to address the so-called other human differences, and evaluate their impact on the three pillars of inclusive education, namely students' access, continuity, and successful completion.

Simultaneously, another growing category emerged from our analysis, allowing us to compile a list of the challenges HEIs must address in order to serve the entire student population. This category highlights the challenges faced by HEI seeking to develop IVE educational designs.

Challenges Faced by HEI in Creating Inclusive Curricula

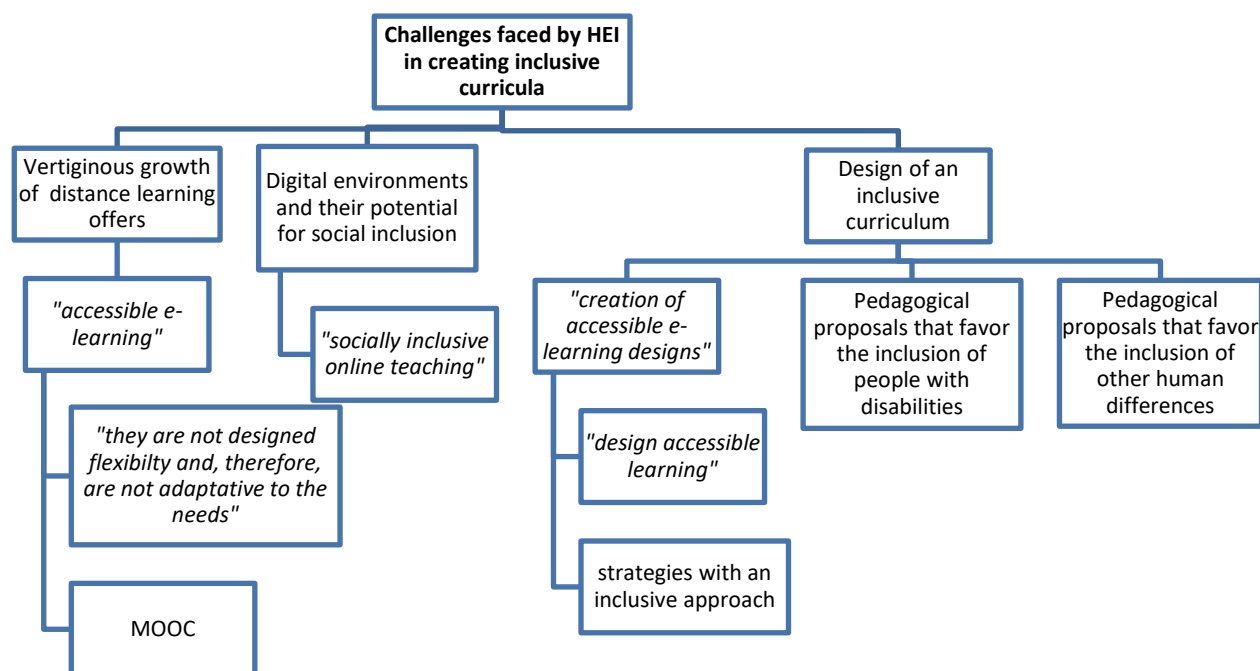


Figure 4. Challenges faced by HEI in creating inclusive curricula. This mind map illustrates the subcategory and its properties. Some of the text is framed in quotation marks and italics, which correspond to brief textual quotations from some of the articles studied, while the others correspond to codes created by the researcher.

Among the challenges HEI face in creating inclusive curricula, there are two large subcategories (see Figure 1), namely ICT and its inclusive potential and principles of inclusive education. These will be dealt with later. However, as Figure 4 illustrates, these challenges also stem from the dramatic growth of distance

learning, from the possibility of digital environments to address social inclusion, and from an obligation to design inclusive curricula that adjust to the heterogeneity in our virtual classrooms. Regarding the inclusive potential of ICT, its flexibility and use of technical aids to enhance learning has been extensively discussed in the literature. Some studies have questioned the inclusiveness of online courses, recognizing the development and advancement of assistive technologies, with a focus on accessibility, to address all student diversities and almost all existing disabilities. It is valid to emphasize the positive role that people with disabilities have played in this technological advance, as seen from the social model of disability. As a limiting variable, it is well known that some of these aids are costly, one reason why they do not reach all social and economic sectors, which becomes one of the barriers that hinders the learning possibilities of ICT (Fermín, 2013).

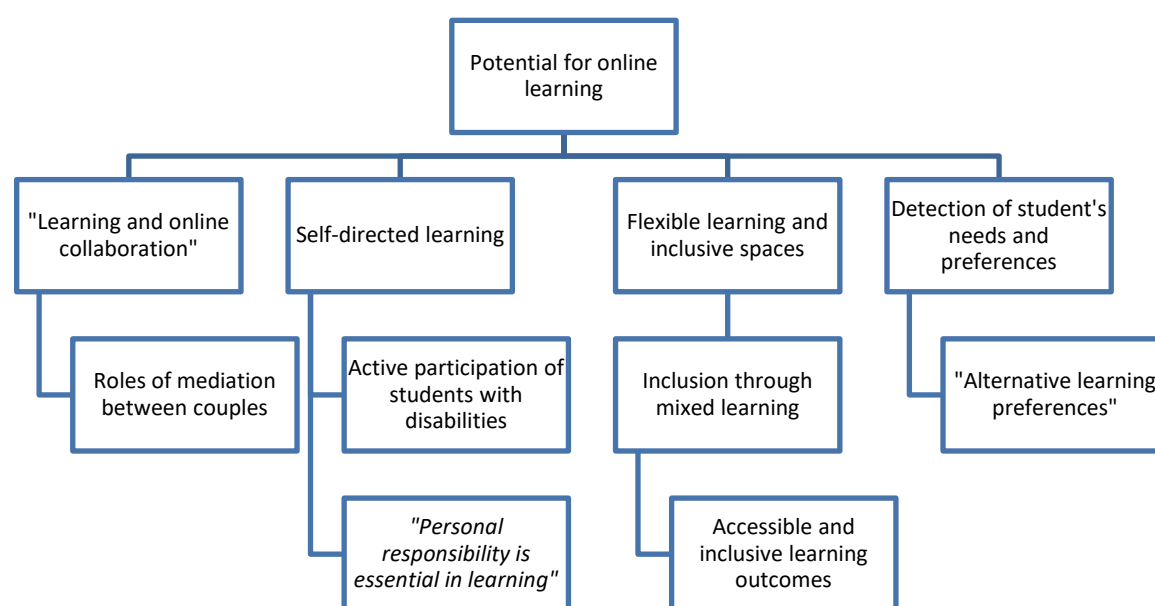


Figure 5. Contributions to the learning process generated by distance education. This mind map illustrates the property and its dimensions. The dimensions give off codes, with some of them framed in quotation marks and italics. This is because they are "in vivo" codes and/or quotations from some of the articles studied, while the others are codes created by the researcher.

In Figure 5, one dimension in the subcategory related to online learning potential deals with the mediating role among peers, a condition that favors online collaborative learning. Sadykova (2014) examined the mediation roles that peers may play in the context of multicultural online learning environments. Peers become invaluable mediators of knowledge. To this effect, the previous author proposed the design of proactive, collaborative learning courses. This aligns with the socio-constructivist approach to teaching and learning that underlies educational designs from different countries, and therefore becomes an interesting contribution to be considered by curricular and instructional designers.

Additionally, self-directed learning acknowledges the importance of students' responsibility in their learning process. It is important to consider the flexibility needed in learning environments that are turned into inclusive spaces, as well as how technology is used to detect students' needs and preferences (Santos et al., 2013). We highlight this personal responsibility to the flexibility explained above, as a significant contribution to planning for teaching and learning processes that generate an impact on how courses are designed, considering all necessary adjustments from the design stage.

An important concept emerged from our research: teacher training and support for developing inclusive e-learning. There are three aspects to this concept. First, there is the idea of the teachers' role in the accessible design of e-learning, which is significantly focused on people with disabilities. This aspect is apparent in several studies that conceived educational inclusion as being focused on people with disabilities. Second, some studies demanded that teacher training address the inclusion of other human differences, complemented by the express need to train academics in online learning technologies in inclusive environments, beyond merely technical issues. It is necessary to take a closer look at the principles of inclusive education, in order to provide educators with the necessary knowledge and tools they need to design opportunities for inclusive learning. In this regard, it is worth noting that training for teachers cannot be limited to a specific moment, but should rather be part of on-going support for the development of processes that attend to diversity (e.g., a support unit that may respond to the multiple challenges teachers face in their pedagogical praxis). As a starting point, we must assume that IVE is part of a dynamic, multi-factorial, and complex process, which involves the participation of multiple actors. If we simply take actions that focus on students, we ignore a key factor in the process—the teacher—and set ourselves up for failure.

Thirdly, in parallel, there is evidence of a greater awareness of the cultural diversity that characterizes the student population at HEI, which merits the development of educational designs that recognize, value, and respect that diversity (Sadykova, 2014; Shimoni, Barrington, Wilde & Henwood, 2013). Thus, it is worth highlighting the development of culturally sensitive and relevant educational designs as an attribute of virtual education.

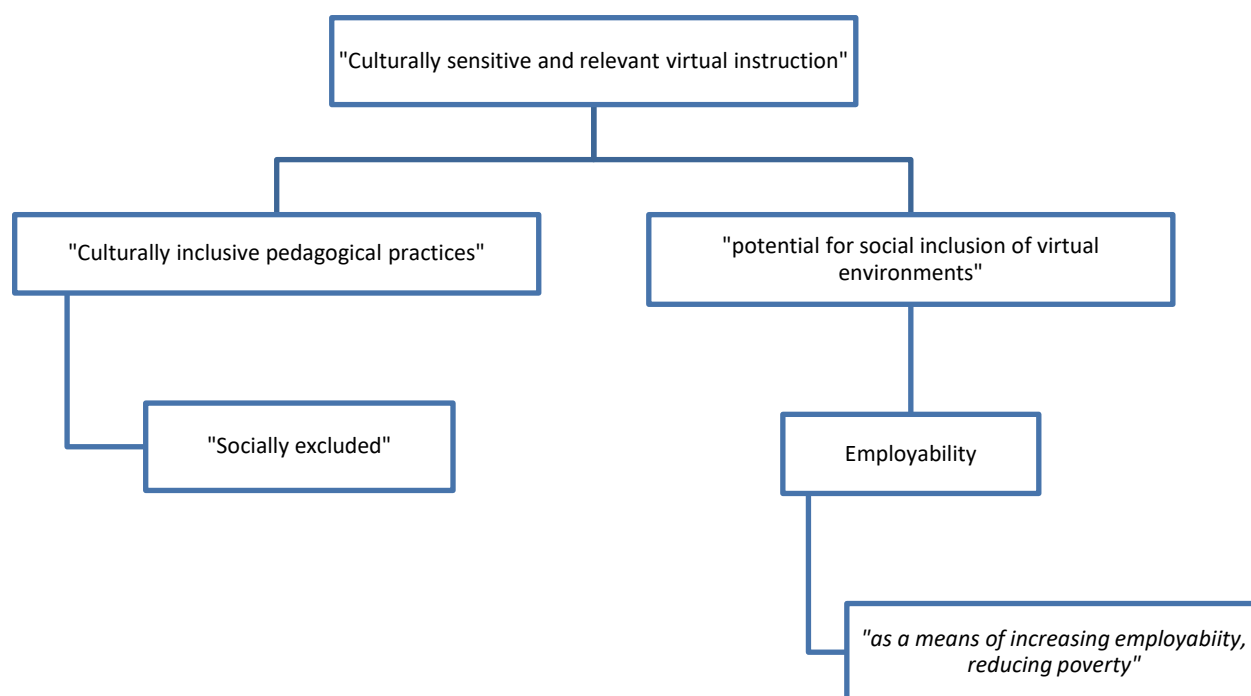


Figure 6. Contributions to the learning process generated by distance education. This mind map illustrates the property and its dimensions. The dimensions give off codes, with some of them framed in quotation marks and italics. This is because they are "in vivo" codes and/or quotations from some of the articles studied, while the others are codes created by the researcher.

Figure 6 illustrates the potential for social inclusion in virtual environments, with the need to design culturally inclusive pedagogical practices that serve socially excluded sectors, often a product of the digital gap. Such practices may contribute to improving employability rates, reducing poverty, and increasing education rates for those who cannot have access to higher education due to a lack of economic and social resources, geographic distance, and poor technological competences, among other risk factors. Parrish and Linder-VanBerschot (2010) recognized the multicultural nature of educational environments, which suggests that instructional designers, especially those working in online environments, need to develop skills in delivering culturally sensitive and adaptive instruction. It is worth considering whether we have taken advantage of this potential for social inclusion or whether, on the contrary, we have widened the gap. Perhaps, efforts to include people in vulnerable socio-economic conditions have not sufficiently improved their technological skills so they can have access to better job opportunities, thus allowing them to overcome the limitations of their impoverished situation. Deepening this line of research would allow us to take action to reduce the educational exclusion of certain social, cultural, and economic groups, as a guarantee of the right that assists them to receive a quality education under conditions of equity.

In parallel, in order to take advantage of ICT's potential, it is necessary to identify the barriers to learning in virtual environments.

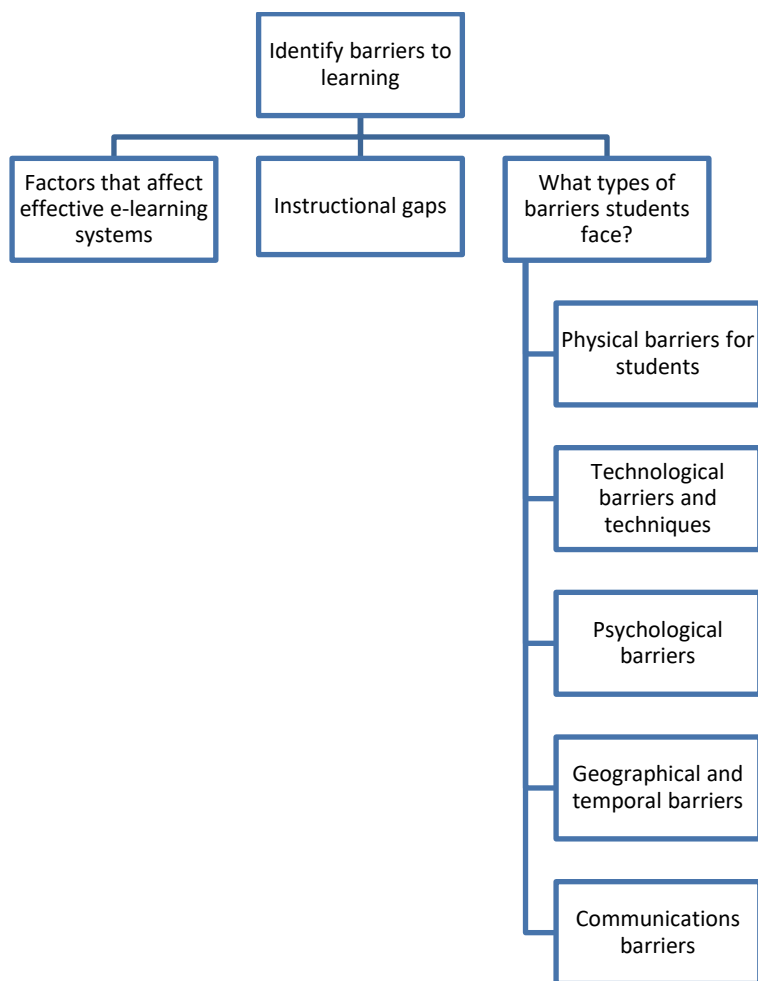


Figure 7. Identifying barriers to learning. This mind map illustrates the property and its dimensions.

Figure 7 illustrates how some studies are focused on identifying the factors that affect effective online learning systems, as well as instructional gaps. Above all, we emphasize the importance of recognizing the types of barriers students face, with a clear impact on their learning processes. Most of the time, this translates into very high rates of student desertion, as a result of the insufficient development of programs that guarantee not only access, but above all continuity thin the educational system and successful completion. We are aware that this situation is not exclusive to virtual education, since it is also observed in face-to-face modalities. Based on our review of the research, we were able to classify these as (a) physical, (b) technological and technical, (c) psychosocial, (d) communication, and (e) geographic-temporal barriers.

And finally, within this subcategory, we find the attribute related to multimedia design; therefore, we ask ourselves whether current designs may be considered inclusive.

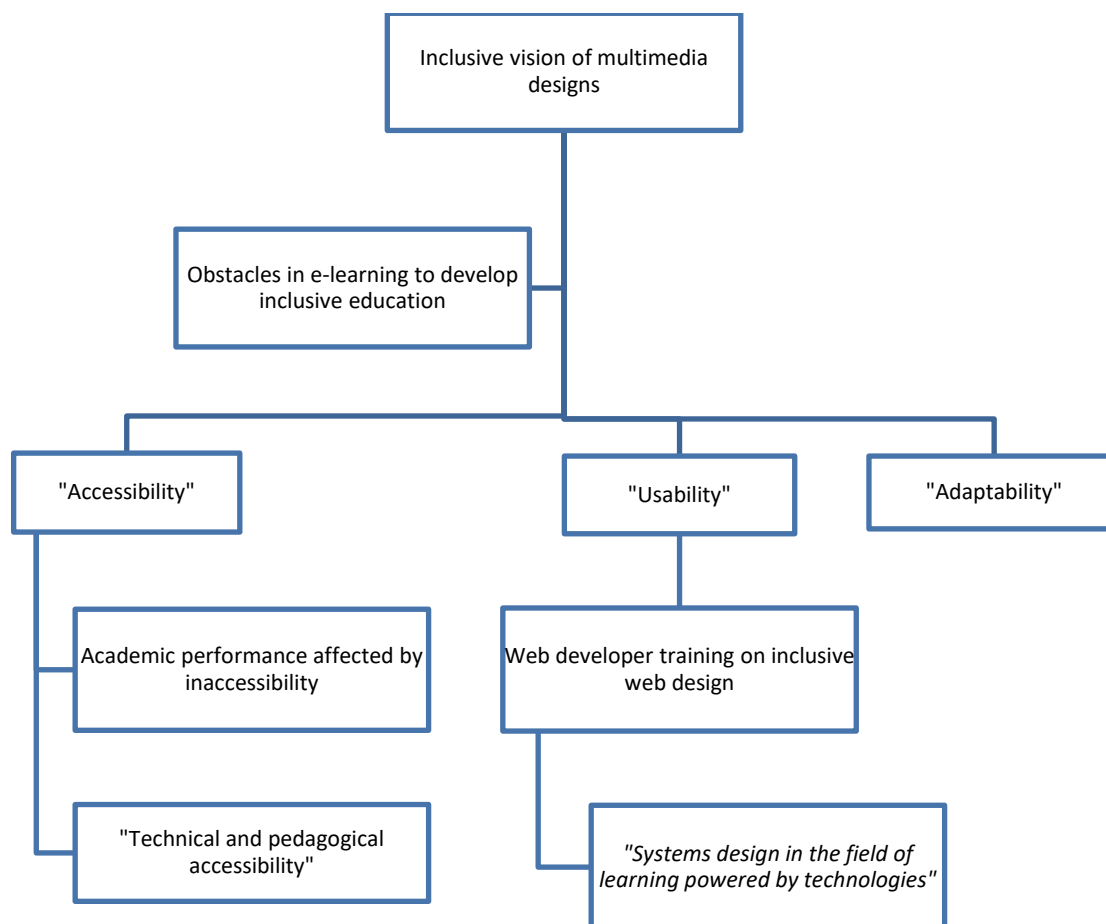


Figure 8. Inclusive vision of multimedia design. This mind map illustrates the property and its dimensions. The dimensions give off codes, with some of them framed in quotation marks and italics. This is because they are "in vivo" codes and/or quotations from some of the articles studied, while the others are codes created by the researcher.

There are two perspectives regarding this attribute. First, there are studies that highlighted the qualities of their designs within the framework of an inclusive proposal, such as accessibility, usability, and adaptability, with many stressing the importance of training Web developers in how to design inclusive Web systems for virtual learning (Granic & Adams, 2011; Radovan & Perdih, 2016). Second, it was necessary to redefine those that question the inclusiveness of Web designs, in terms of reflecting on the obstacles of e-learning to develop inclusive education, and which are closely related to the barriers mentioned above (Calvo, Iglesias, & Castaño, 2017). Not designing or using inclusive learning resources means that you do not allow all students to have access to information; and this may affect their academic performance or result in them not completing the course, not as a product of their personal limitations, but because of the inaccessible design of virtual courses.

Furthermore, in the category of challenges of HEI to create inclusive curricula, the second subcategory (i.e., the principles of inclusive education) was found in several studies.

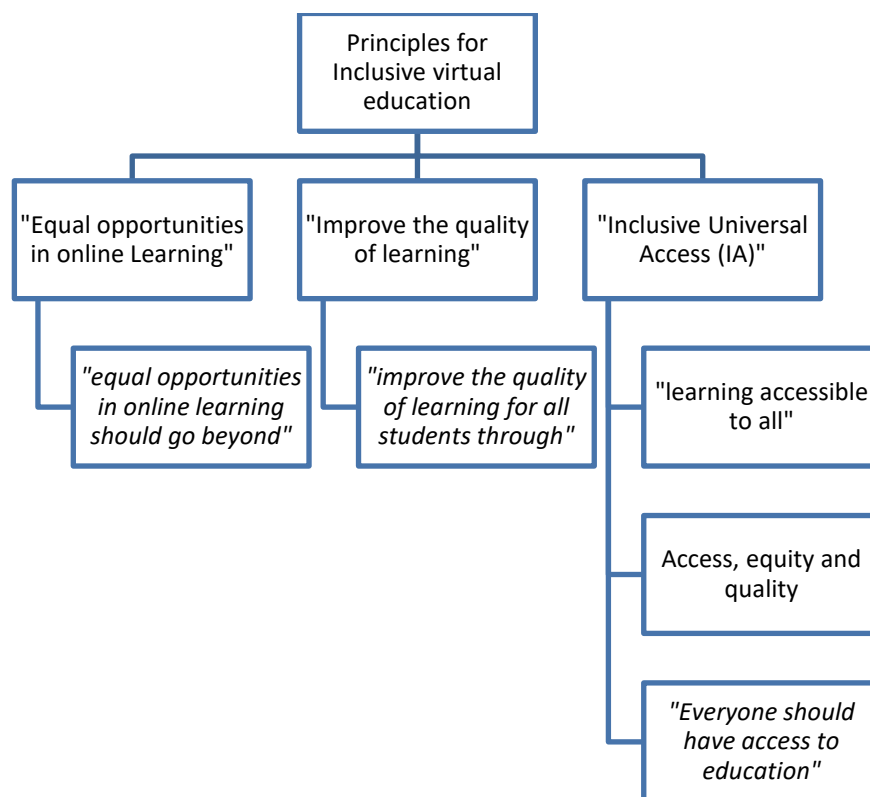


Figure 9. Principles for inclusive virtual education. This mind map illustrates the property and its dimensions. The dimensions give off codes, with some of them framed in quotation marks and italics. This is because they are "in vivo" codes and/or quotations from some of the articles studied, while the others are codes created by the researcher.

As may be seen, the studies we analyzed highlighted principles that determine inclusive education, such as (a) inclusion, (b) accessibility, (c) equal opportunities, (d) non-discrimination, (e) affordability, and (f) universal design of learning. As indicated earlier, these are closely related with access, equity, and quality. Any design for virtual education that intends to be inclusive must be closely linked to diverse actions that guarantee accessibility, overcoming the barriers described above. Such programs must guarantee educational quality, and allow for the development of optimum competences in all students, without any discrimination. They must, finally, respond to the principle of equity. Educational policies and programs need to not only reduce access gaps, as has been the case until now, but also address the digital divide between those who have the necessary skills to benefit from the use of computers and those who do not. These skills are closely linked to students' social, economic, and cultural capital.

Our analysis found research in which inclusion in online university education recognized the most explicit and traditionally defined differences, expressed as people with disabilities in its various manifestations. Thus, these studies proposed multiple strategies to support the inclusion of this student population. We explicitly see the contribution of ICT through, among others: (a) assistive technology; (b) the development of accessible electronic learning materials and activities; (c) the curricular design of accessible content; (d)

the development of metacognitive processes to motivate students through ICT; (e) affordable, accessible, and available technologies; and (f) development of accessible online learning environments.

Other research proposed inclusive e-learning while assuming that diversity recognizes the multiple differences that characterize human beings. These studies include Granic and Adams (2011), who proposed active and accessible learning, by way of effective e-learning systems. They considered various factors, such as accessibility, individual differences, and student models.

Al-Azawei et al. (2017) suggested that the standardization of learning content and teaching approaches denies the diversity of the student body and they recognized student diversity based on individual skills and preferences. Thus, they proposed to integrate the UDL (i.e., multiple means of representation, action and expression, and participation) with a technology acceptance model theory of information systems.

Finally, there is the potential of social inclusion in higher education that may be achieved with IVE proposals, based on the study developed by Moreira, Reis-Monteiro, and Machado (2017). They recognized that the widespread increase in higher education, with learning accessible to all, requires a flexible and inclusive option focused on students, including those who are socially excluded, such as those who are imprisoned.

Conclusion

We did not expect to reach definitive conclusions from an exploratory study intended to identify emerging trends in IVE research at the higher education level according to their conceptualization of inclusion, in order to provide ideas for future research topics and issues for further study. In order to achieve our goals, we set a series of questions that allowed us to focus our analysis, following the methodological guidelines described above on a systematic review of research published in the WOS and Scopus databases in the last decade. However, our findings surpassed the focus of our initial questions. This suggests a series of interesting data that provide a broader view of the phenomenon studied, and offer ideas regarding potential lines of research. Initially though, we will present the conclusions based on our research questions.

By studying current designs for inclusive e-learning and examining how they define inclusion, we were able to find a total of 89 studies that address this issue from different approaches and perspectives. While 51 focused on IVE as directed to people with disabilities¹, the remaining 38 focused on other human differences. Pointing out this distinction does not imply that we are qualifying the approaches as being pertinent or not. However, the accelerated changes occurring in the massive growth of virtual education, among other issues, leads us to question the relevance of continuing to develop IVE designs that address only one type of human difference. The premise that the current university reality is much more complex and diverse demands the development of online education alternatives that may include all students, considering their singularities. As distance learning at universities increases, it is becoming a space of growing student diversity. This implies a challenge for all of those who are responsible for virtual educational offerings at all of its stages: these include: (a) curriculum and instructional designers, (b) Web

developers, (c) principals, and significantly, (d) teachers, who will have to rethink their pedagogical praxis in order to respond to this challenge.

We encountered a range of challenges for HEI. The development of IVE proposals that guarantee the principle of EEO recognize the potential of education to overcome socio-educational inequality. This is why it is so important for there to be an increase in the number of virtual educational offerings, with flexible modalities. In addition, this growth cannot be limited to access, but must be balanced with quality and equity. This reinforces a specific concern raised in the analysis. In the studies we reviewed, there was a clear emphasis on improving conditions that increase access to virtual courses. However, there was practically no development of support programs to assure the IVE that we aspire to, implementing actions to guarantee the continuity and successful graduation of all students, so we may increase the competitiveness of society.

The ways in which research conceptualizes IVE is obviously closely related to their vision of inclusion. By assuming inclusion with a focus on people with disabilities, multiple initiatives have intended to ensure accessibility, including the development and innovation of various technical aids to enhance learning, supported by assistive technologies. Lebenicnik, Pitt, & Starcic (2015) emphasized the importance of the UDL model in responding to the needs of inclusive learning environments. Meanwhile, Santos & Boticario (2015) compiled guidelines to produce personalized recommendations in order to encourage active learning in online courses. It must be emphasized that all of the efforts and innovations in the design of accessible resources and platforms serve to benefit not only people with disabilities, but represent benefits for all. However, the more heterogeneous the student population is in online university courses, the more other innovations are required.

In some studies, inclusion encompassed other human differences (e.g., gender, age, socioeconomic situation, ethnic origin, culture, health condition, learning capacity, language, lifestyle, learning) as well as students with heterogeneous levels of foreknowledge, and working students with different professional expectations and demands. These studies discussed a series of pedagogical innovations that allow students to be served according to their uniqueness, overcoming the barriers that restrict learning. For example, Lalla (2015) described the development of inclusive pedagogical practices to address communication barriers, focusing on language proficiency as a major challenge for international students in online education. In addition, Allison and Turner (2017) highlighted how students in virtual studies can perform their tasks associated with specific learning objectives by using virtual resources without geographical location or time constraints, thus enabling collaborative learning to take place.

It was a constant in several of the studies analyzed, that for the development of an IVE educational design, it is not enough to invest in advanced technologies incorporated in virtual platforms; it is essential to train two key actors in the process, namely teachers and Web developers (including instructional designers). This training must place the needs of students at the center of accessibility. In order to do so in a virtual mode, through the development of inclusive learning experiences that respond to the principles that regulate IVE, it is necessary to overcome technical issues, and include, indisputably, pedagogical aspects.

In recent years, while there has been a growth in the development of IVE educational designs that recognize all human diversity, this has not been enough. It is necessary to evaluate the innovations made so far,

optimize them, and replicate them in other contexts, so that in the coming years, we may be able to respond to the phenomenon of a massive university student population, expressed in its most absolute heterogeneity, through flexible and inclusive educational designs.

Based on the above, we suggest inclusive e-learning designs be developed with greater emphasis on all human differences. In this way, we may contribute to increasing equality of educational opportunities and to overcoming the barriers that restrict access, continuity, and successful completion by all students, regardless of their individual learning needs. Likewise, greater emphasis should be placed on developing skills for employability. Educational inequality persists; there are more and more educational requirements to access jobs that allow social advancement.

Finally, we are aware that there are still many questions that remain unanswered, and we hope that the data presented will contribute to consolidating lines of research that will provide new insights to ensure the development of truly inclusive e-learning processes. We believe that there is not a single answer to these and other questions. How should a training proposal respond to the principles of educational inclusion outlined at the beginning of this article? How could all human differences be addressed from a virtual education design? This article cites several studies that may lead us to some answers for these questions.

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¹ These results coincide with what was presented in Almeida, Santos, Batista, Pereira, and Sousa (2016), who analyzed the Websites for Higher Education Institutions in Portugal. They found that the initiatives focused mainly on people with disabilities, and we agree that, historically, this population has been excluded from various educational designs. Today we know they are not the only ones excluded, and in order to guarantee education as a human right for all people, our efforts must encompass the other human differences mentioned in this article.