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Perception of the Use of Virtual Reality Didactic Tools among Faculty in Mexico

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Abstract: This paper develops descriptive quantitative research of the assessments of virtual reality (VR) technology, used as a didactic tool, by a sample of 712 university professors in Mexico. For this purpose, a validated Likert-type questionnaire was used as an instrument, the responses to which were statistically analyzed. The results obtained show that professors in Mexico report low levels of digital skills, but high valuations of VR. These ratings depend strongly on the professors' area of knowledge. In this sense, the biggest gap is between Engineering professors, who value VR better, and Humanities professors, who value it worse. There are also gender gaps and gaps due to the digital generation of the participants in the assessments made, whose behavior is also different according to the area of knowledge. As a result, some recommendations are provided to try to reduce the gaps found.

Keywords: reality–virtuality; higher education; digital resources; economic and technology growth

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1. Introduction

1.1. Presentation and Approach

Virtual Reality (VR) is a computer technology that allows the development of virtual scenarios with a real appearance, in which the user, with a certain degree of immersion, can interact [1]. Within VR, there are different technologies depending on the degree of immersion and the devices used: (i) Immersive Virtual Reality (IVR); and (ii) Non-immersive Virtual Reality (NIVR). IVR is defined as VR technology in which the user has different senses—mainly sight, hearing, and even touch—immersed in the virtual scenario created, thanks to the use of different gadgets such as headsets, platforms, remote control, etc. Headsets stand out as the essential gadgets to be able to use the IVR.

In recent years, VR has been implemented in different sectors of economic and business activity. Sectors such as engineering, education, or health have integrated this technology in their different activities, obtaining greater effectiveness in the development of their activities and obtaining better services, products, and results [2,3]. Similarly, VR is positioned as a technology that promotes social development, inclusion, equality, or sustainable development [4]. Therefore, VR is positioned as a multiplier technology, which promotes the technological, economic, and social development of the regions where its implementation is encouraged [5,6].

Mexico is currently among the largest economies in the world in terms of Gross Domestic Product (GDP). In the case of Latin America, only Brazil and Mexico are among the twenty world economies with the highest GDP [7,8]. With a GDP of more than 1.3 trillion dollars [9], Mexico is in a higher position than several European countries such as Spain, Sweden, Ireland, or Belgium. On the other hand, Mexico is among the countries with the highest competitiveness index, ranking among the countries with the best development and prosperity expectations, and being one of the four most important emerging markets in the world [10,11]. In terms of innovation, the Global Innovation Index (GII) 2022 places

Mexico among the three most innovative Latin American economies, behind only Brazil and Chile—whose economy is the most innovative [12].

However, Mexico suffers from different weaknesses in economic and social aspects: (i) it is among the nations with the worst income distribution and, consequently, with high levels of inequality [13,14]; (ii) it has been an emerging economy since the start of the 20th Century, suffering in its balance of payments from the loss of profitability and productivity as a result of different economic crises [15–17]; (iii) there is unstable public investment in Mexico [18]; (iv) it has limited access to financing [18]; and (v) there is an absence of government policy that contributes to stimulating technological innovation [19,20].

VR is an important educational technology that could enhance the teaching–learning process and facilitate the acquisition of knowledge and soft skills [21,22] through the development of advanced didactic methods [23]. However, for VR to be implemented as a didactic tool in the Mexican university system, university professors must have a positive perception of its implementation and development [24]. Similarly, Mexican university professors must have high levels of digital skills that allow them to incorporate VR as a didactic method in their teaching activities [24]. However, the literature also presents the existence of a series of limitations that, in general, affect the use of VR technologies in the classroom, which, in the case of Mexico, become notable precisely due to the weakness of its digital transformation process [25]: (i) availability of devices; (ii) development of techno-pedagogical skills of faculty; and (iii) specific training of teachers for the use of VR.

One of the variables that has proven to be most influential in digital competence and in the opinions on the use of digital didactic tools is the digital generation. According to Prensky's theory [26,27], two major generations can be distinguished depending on the relationship they have had with digital technologies and the perception they have about them: (i) digital immigrants: born before 1980, they have not grown up linked to digital technologies, so they have had to incorporate these technologies progressively into their lives; and (ii) digital natives: born after 1980, they have grown up with regular access to different technological resources.

Another variable that typically discriminates the didactic use of VR is the professors' area of knowledge [1]. Thus, it is reasonable that the use of these technologies is more frequent in areas in which, a priori, they seem more naturally applicable, such as Health Sciences [3], Sciences, or Engineering [2]. However, it should be noted that the literature presents an abundance of VR developments applied to the teaching of different fields of the Social Sciences, such as geography [28] or studies on human behavior and social interaction [29]. In addition, the technical opportunities offered by VR make it an ideal tool for visualization and interaction, for example, with works of the most varied artistic and literary disciplines [30,31], which shows its strong applicability to the field of humanistic education.

Given the need to incorporate VR as a didactic tool in the Mexican university system (Figure 1), this research aims to analyze the perception that Mexican university professors of different digital generations have about the didactic use of VR technologies in higher education.

1.2. Research Objectives

The general objective of this research is to analyze the perception that Mexican university professors have about the didactic use of VR technologies in higher education. In particular, this general objective translates into the following specific research objectives: (i) to describe the perceptions that Mexican university professors have about the use of VR in their lectures; (ii) to analyze the gaps in the above perceptions by professors' area of knowledge; and (iii) to identify the differences that exist between areas of knowledge with respect to the above perceptions regarding the behavior of the gender gap and the digital generation gap in the responses.

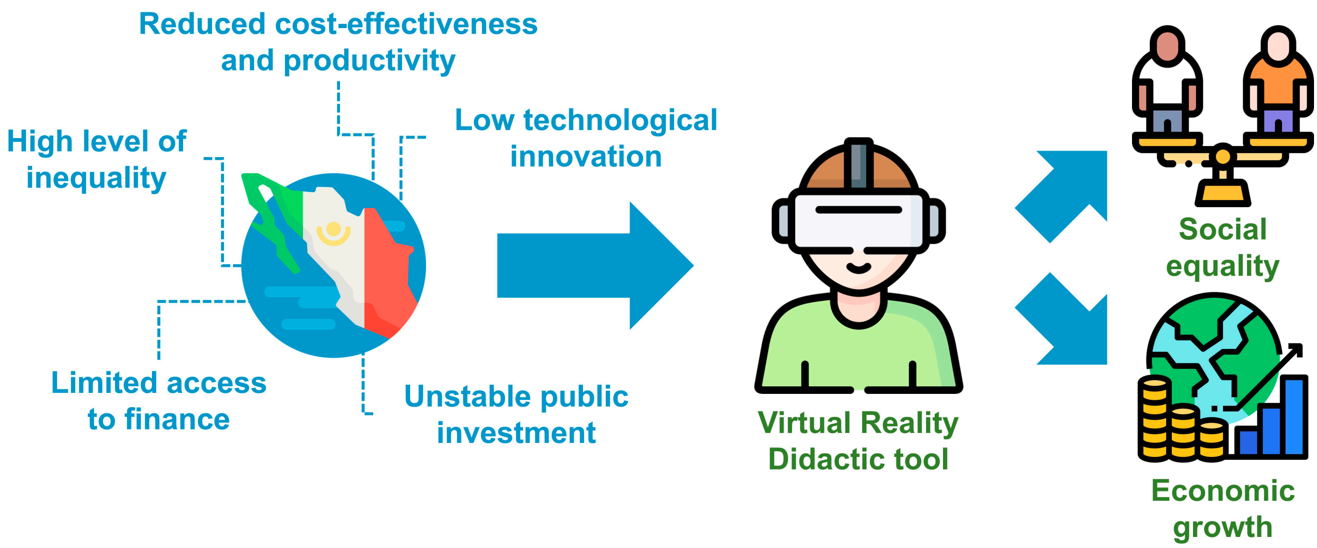

Figure 1. Mexico's problems and benefits of implementing VR as a teaching tool in the university system.

2. Materials and Methods

2.1. Participants

This study involved 712 professors from different universities in Mexico who were chosen by a non-probabilistic convenience sampling process. The term professor covers all educators who teach at the universities, including teaching assistants, assistant professors, associate professors, and full professors. All participants attended a training session on the didactic use of VR technologies which was given by the authors every two weeks from January to June 2022. The professors who attended the previous course are professors interested in the use of new technologies in the teaching field and who voluntarily signed up for the course, but who do not have experience in the use of VR technologies or previous knowledge in this regard. Thus, it can be assumed that, at the time of answering the questionnaire used as a research instrument, the participants had sufficient and homogeneous knowledge about VR. This training session had the following objectives: (i) to present VR technologies, concepts, types, and applications; (ii) to describe the main technical aspects of VR; and (iii) to present the techno-pedagogical and didactic uses of VR in higher education. The criteria for inclusion in the study were the following: (i) to be a practicing professor at a university in Mexico; and (ii) to have attended the training session on VR given by the authors. After the training session, the questionnaire used as an instrument was sent to the registered professors, and the research purpose of the data collection was explained to them. The professors responded to the questionnaire in a voluntary, free, and anonymous manner. A total of 730 responses were collected, of which 712 were considered valid in the sense that they were complete and provided by professors who met all the inclusion criteria.

The majority area of knowledge among the participants is Social Sciences (32.58% of the total sample), followed by Engineering (22.47%) and Humanities (19.66%), while the minority areas are Sciences (14.61%) and Health Sciences (10.67%). The distribution of participants by areas of knowledge is not homogeneous (chi-square = 49.9550, df = 4, p-value < 0.0001). Although there is a certain majority of females over males in all knowledge areas except Engineering (Figure 2), the chi-square goodness-of-fit test does not identify a significant gender bias (chi-square = 7.9738, df = 4, p-value = 0.0925). Instead, there is some bias by the digital generation of the participants (chi-square = 13.0170, df = 4, p-value = 0.0112), as digital immigrants are in the majority in all areas and mainly in Health Sciences (Figure 3).

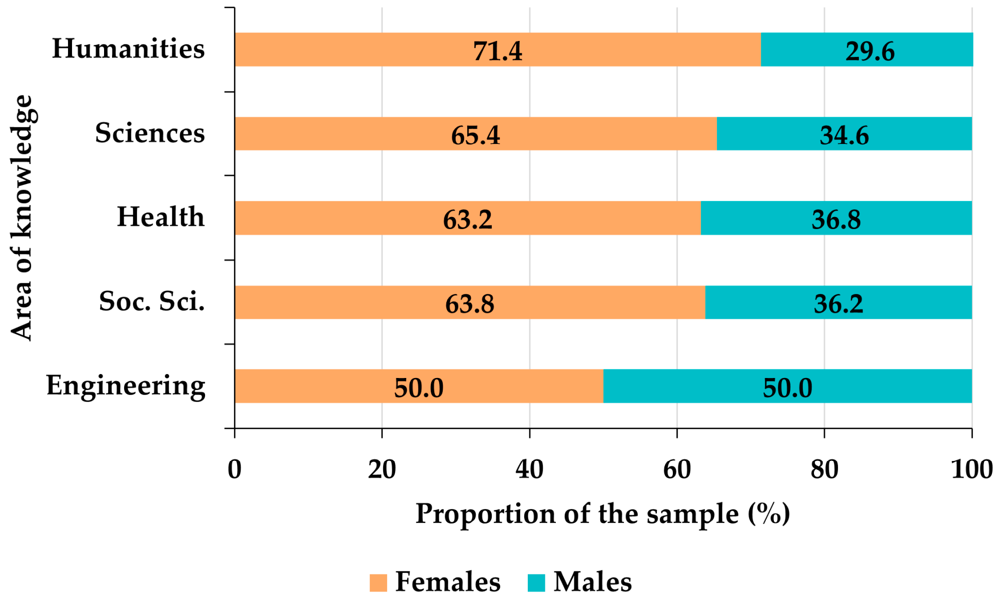

Figure 2. Distribution of the participants by knowledge area and gender.

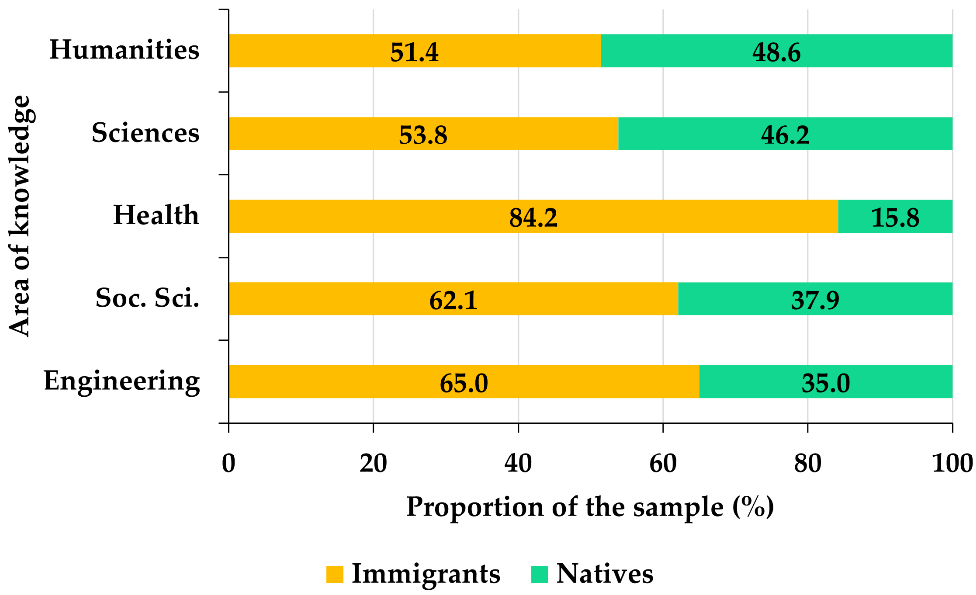

Figure 3. Distribution of the participants by knowledge area and digital generation.

2.2. Research Variables

For the achievement of the objectives of the work, a quantitative and correlational research has been designed, based on the statistical analysis of the responses given by the participants to a validated questionnaire, whose answers are measured on a Likert scale from 1 to 5. Specifically, three independent research variables are distinguished. The primary independent variable is the area of knowledge, which is a nominal polytomous variable whose possible values are the different areas of knowledge considered—Humanities, Sciences, Health Sciences, Social Sciences, and Engineering—. The two secondary independent variables are gender—a dichotomous nominal variable with values female or male—and digital generation—a dichotomous nominal variable whose possible values are digital immigrant or digital native—. Likewise, the following dependent variables are defined (Figure 4): (i) level of self-perceived digital skills for the use of VR; (ii) assessment of the technical characteristics of VR; (iii) assessment of the disadvantages of VR; (iv) assessment of the usefulness and didactic employability of VR in the lectures. All dependent variables are quantitative and have been measured on a 1 to 5 Likert scale, where: 1—null; 2—low; 3—moderate; 4—high; 5—very high.

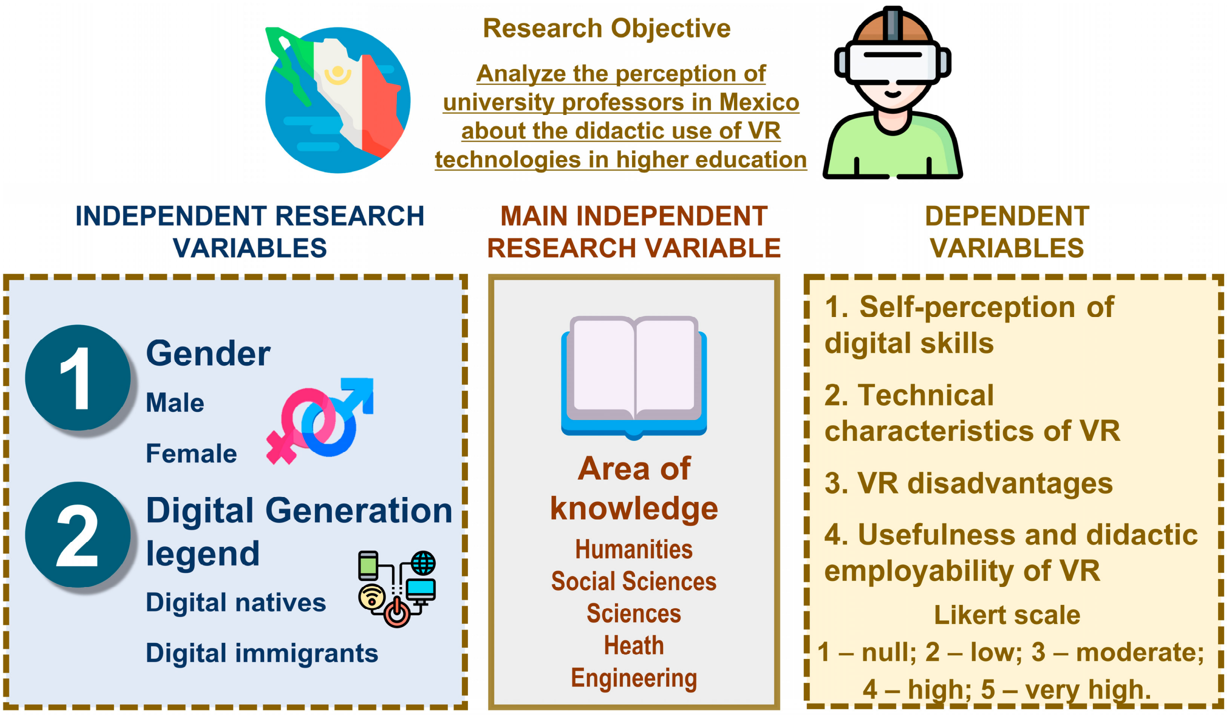

Figure 4. Research variables.

2.3. Instrument

For the purposes of this research, a previously validated questionnaire (Appendix A) on the perception of the didactic use of VR among university professors has been used [32]. The questionnaire consists of 17 questions that ask for ratings on different aspects of VR on a Likert-type scale from 1 to 5, where 1 means no rating and 5 means a very high rating. The instrument has been validated both in terms of the construct and in terms of its internal consistency. The validation of the construct has been carried out through a factorial analysis, which has determined a theoretical model of 4 factors that explain the instrument and that correspond to the four dependent variables considered in this study. Thus, the four factors are the following: (i) digital skills in relation to the use of VR—questions 1 to 3; (ii) assessment of the technical characteristics of VR—questions 4 to 10; (iii) disadvantages of VR—questions 11 to 13; and (iv) employability and didactic effectiveness of VR—questions 14 to 17. Internal consistency validation was performed by computing the composite reliability and Cronbach's alpha parameters. The composite reliability parameters of the indicated factors are between 0.6986 and 0.8903, the average variance extracted parameters are between 0.5712 and 0.6947, and the Cronbach's alpha parameters fluctuate between 0.7063 and 0.9078 [32]. Therefore, the 4-factor theoretical model has high levels of internal consistency.

The parameters of the confirmatory factor analysis computed from the responses obtained show that the described theoretical model effectively explains the responses obtained. In fact, the incremental fit indices are good (AGFI = 0.8684; NFI = 0.8747; TLI = 0.8948; CFI = 0.9126; and IFI = 0.9134) and the absolute fit indices are also adequate (GFI = 0.9028; RMSEA = 0.0745; AIC = 414.4241; and chi-square/df = 2.9595). Likewise, the reliability parameters indicate that the defined factors enjoy high levels of internal consistency (Table 1).

Table 1. Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) parameters.

	Cronbach's Alpha	CR	AVE
Skills for VR use	0.7455	0.7028	0.5944
Technical characteristics	0.8919	0.8867	0.6833
Disadvantages of VR	0.7318	0.7191	0.6079
Didactic usefulness of VR	0.8235	0.8272	0.6310

2.4. Design and Statistical Analysis

The present research is of a quantitative descriptive and correlational nature and has been developed in the following phases (Figure 5): (i) delivery of the initial training session on VR; (ii) sampling and response collection; (iii) statistical analysis of the data; and (iv) drawing of conclusions.

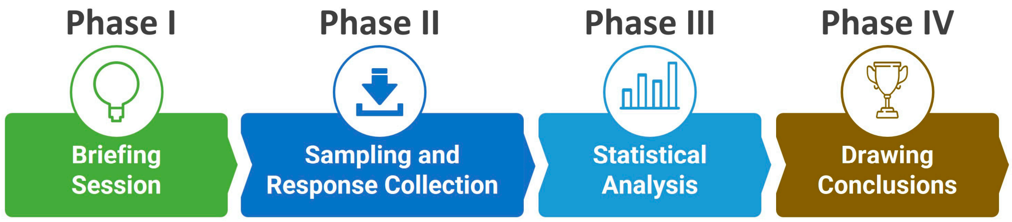

Figure 5. Research procedure.

For the statistical analysis of the data, the main descriptive statistics of the responses to the four families of questions that make up the questionnaire were computed for the overall sample and differentiated by areas of knowledge. The Pearson correlation coefficients of the different families of responses were computed to identify which of them were significantly linearly dependent on others, and the linear regression of the pairs of families of responses that were found to be significantly dependent was obtained. Due to the significant asymmetry of the responses, the Kruskal–Wallis nonparametric test was used to compare the mean responses given for each family of questions by the professors of the different areas of knowledge and thus identify gaps by area of knowledge in the assessments of the participants. Finally, the existence of gender gaps and gaps due to the digital generation of the professors was contrasted using the multifactor analysis of variance test.

3. Results

Mexican professors give very high ratings of the technical characteristics of VR as well as of its didactic applicability in the lectures. In addition, the responses to these two families of questions are the ones that present the least dispersion—with variations of approximately 20%—and the most pronounced left skewness (Table 2). The assessment of the level of disadvantages of VR is intermediate–high, although in this aspect, the responses are the most dispersed of all, and the left asymmetry is not as pronounced as that presented by the families of responses on the technical and didactic aspects of VR (Table 2). The lowest mean rating is reached by the family of questions on digital skills, which is intermediate–low, with these responses being distributed approximately symmetrically (Table 2).

From the Pearson correlation coefficients, the following statistically significant dependence relationships can be deduced (Table 3): (i) the assessment of the technical characteristics of VR correlates positively with the level of digital skills; (ii) the assessment of the disadvantages of VR increases as the assessment of the technical aspects increases; and (iii) the assessment of the didactic aspects increases with the assessment of the technical aspects but decreases with the perceived level of disadvantages of VR. From the statistics of the linear regression model (Table 4), it can be deduced that the smallest estimated slopes, in absolute value, are those relating the pairs of variables of technical aspects and digital skills on the one hand and the didactic aspects and disadvantages of VR on the other. This means that, although the rating of technical aspects increases with digital skills and the rating of didactic usefulness decreases when the level of perceived disadvantages increases, the rates of these growth rates are lower than those of the other pairs of variables where: the perception of disadvantages increases when the rating of technical aspects increases, and the rating of didactic usefulness increases when the rating of technical characteristics increases.

Table 2. Descriptive statistics of the responses to the different families of questions.

	Mean (Out of 5)	Std. Deviation (Out of 5)	Coefficient of Variation (%)	Skewness
Skills for VR use	2.79	1.20	42.92	0.02
Technical characteristics	4.22	0.92	21.84	–1.17
Disadvantages of VR	3.67	1.23	33.59	–0.55
Didactic usefulness of VR	4.29	0.87	20.28	–1.24

Table 3. Pearson correlation statistics of the responses of the different families of questions.

	Skills	Technical	Disadvantages	Didactic
Skills	1	0.0613 *	–0.0247	0.0104
Technical		1	0.1017 *	0.1626 *
Disadvantages			1	–0.0782 *
Didactic				1

* $p < 0.05$.

Table 4. Statistics of the linear regression model of the different pairs of factors of the questionnaire with statistically significant Pearson correlation coefficients.

Variables		Estimate	Std. Error	*F*-Statistic	*p*-Value
Technical–Skills	Slope	0.0460	0.0230	4.0100	0.0455 *
	Independent term	4.1177	0.0696		
Disadvantages–Technical	Slope	0.1366	0.0417	10.7400	0.0011 *
	Independent term	3.0928	0.1808		
Didactic–Technical	Slope	0.1785	0.0243	54.0900	<0.0001 *
	Independent term	3.5452	0.1042		
Didactic–Disadvantages	Slope	–0.0568	0.0222	6.6780	0.0105 *
	Independent term	4.4708	0.0858		

* $p < 0.05$.

The area of knowledge of Mexican professors is a discriminating variable for digital skills and ratings of technical characteristics and disadvantages of VR because the Kruskal–Wallis test statistics indicate that the mean responses of these variables in the different areas of knowledge differ significantly (Table 5). Engineering professors are those who express having higher levels of digital skills for the use of VR and those who give higher ratings to the technical characteristics. Humanities professors have the worst self-concept of their digital skills and the lowest ratings for technical features of VR, along with Sciences and Health Sciences professors. In addition, Humanities and Social Sciences professors are those who perceive the highest level of disadvantages of VR, while those who identify the fewest disadvantages are Sciences and Engineering professors.

From the statistics of the multifactor analysis of variance test, it can be deduced that the behavior of the gender gaps is different in each of the knowledge areas analyzed in terms of the responses on digital skills (F-statistic = 5.1818, p-value = 0. 0004), assessment of the technical characteristics of VR (F-statistic = 8.4818, p-value < 0.0001), level of disadvantages of VR (F-statistic = 6.3011, p-value = 0.0001), and assessment of the didactic usefulness of VR (F-statistic = 16.0431, p-value < 0.0001). Males have a higher self-concept of their digital skills than females in Health Sciences, Social Sciences, and, above all, in Engineering—an area in which males outnumber females by almost 20% (Figure 6a). The higher level of digital skills is accompanied by a higher rating of the technical and didactic characteristics by males in not only Engineering and Social Sciences but also in Humanities—although in this area, males have fewer digital skills; and by a lower rating of the disadvantages of VR in the case of males in Engineering, Sciences, and Social Sciences (Figure 6b–d).

Table 5. Descriptive statistics of the responses to the different families of questions and statistics of the Kruskal–Wallis test for comparison of mean values.

	Humanities	Sciences	Health	Soc. Sci.	Engineering	Chi-Square	*p*-Value
Skills for VR use	2.63	2.71	2.79	2.77	3.00	12.13	0.0164 *
Technical characteristics	4.16	4.07	4.09	4.26	4.38	43.27	<0.0001 *
Disadvantages of VR	3.85	3.41	3.53	3.87	3.47	26.70	<0.0001 *
Didactic usefulness of VR	4.29	4.24	4.25	4.28	4.38	2.15	0.7088

* $p < 0.05$.

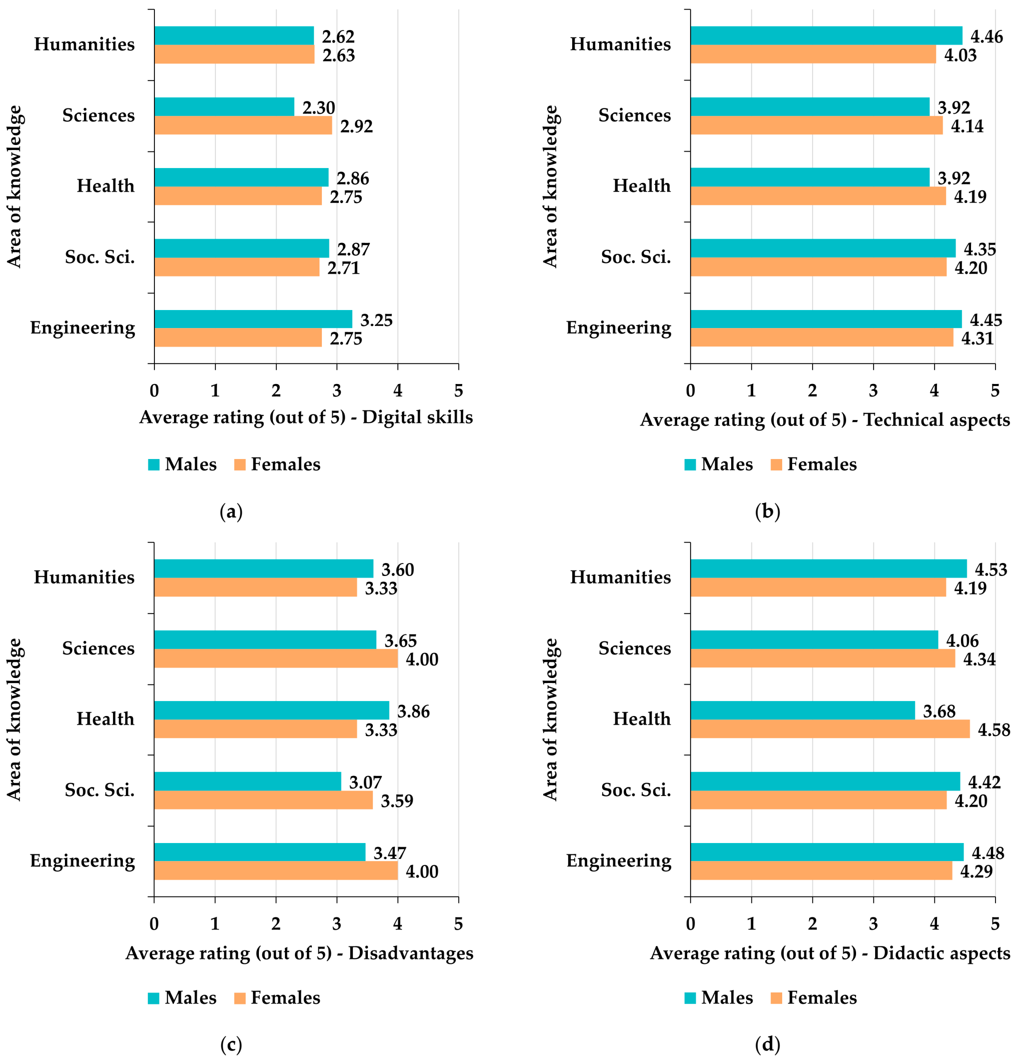

Figure 6. Average ratings, differentiated by areas of knowledge and gender, of the different families of questions: (**a**) digital skills; (**b**) technical characteristics of VR; (**c**) disadvantages of VR; and (**d**) didactic usefulness of VR.

In Sciences, females outperform males in the ratings of all the variables analyzed, while in Humanities, it is females who outperform males, except in the digital skills variable. In

Engineering and Social Sciences, males outperform females in their ratings of digital skills and the technical and didactic aspects of VR, but females identify more disadvantages of VR than males. In Health Sciences, females give higher ratings to the technical and didactic characteristics of VR, but males report better digital skills and identify more disadvantages in the use of VR.

The behavior of the digital generation gap in the responses obtained is also different according to the area of knowledge and is in accordance with the statistics of the multifactor analysis of variance test for the families of questions on the assessment of the technical characteristics of VR (F-statistic = 7.5071, p-value < 0.0001), disadvantages of VR (F-statistic = 8.9145, p-value < 0.0001), and the assessment of the didactic aspects of VR (F-statistic = 6.5665, p-value < 0.0001). However, there are no significant differences in the behavior of the digital generation gap between areas of knowledge in the assessment of digital competence (F-statistic = 1.3983, p-value = 0.2325) given that digital natives report higher digital skills than digital immigrants, except in Health Sciences, where there is a slight superiority of digital immigrants (Figure 7a). In Sciences, digital natives give higher ratings than digital immigrants to both the technical and didactic characteristics of VR and its disadvantages (Figure 7b–d). However, in Engineering, it is the digital immigrants who give higher ratings on the three variables mentioned. In Humanities and Social Sciences, digital immigrants give higher ratings than digital natives to the didactic aspects of VR and lower ratings of its disadvantages (Figure 7c,d). In the case of Health Sciences, it is the digital natives who value the digital aspects more highly and identify the disadvantages of VR to a lesser extent.

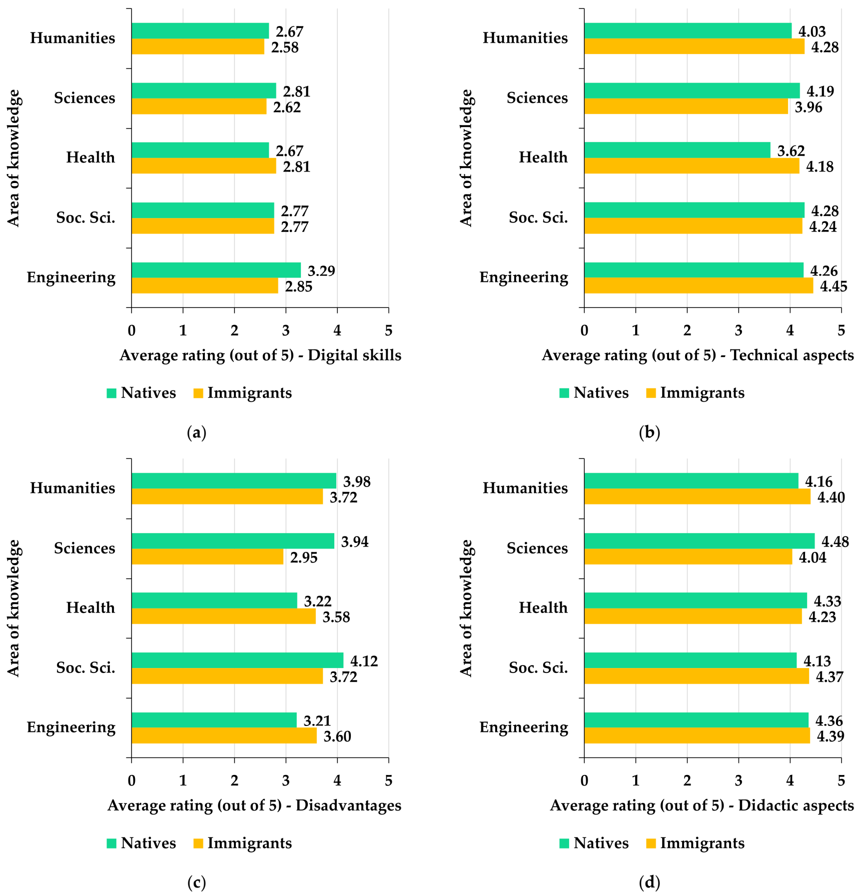

Figure 7. Average ratings, differentiated by areas of knowledge and digital generation, of the different families of questions: (**a**) digital skills; (**b**) technical characteristics of VR; (**c**) disadvantages of VR; and (**d**) didactic usefulness of VR.

4. Discussion

The results obtained show that Mexican higher education professors report having an intermediate–low level of digital skills linked to the use of VR (Table 2). This result is consistent with previous studies that have analyzed the digital skills of Mexican professors. In fact, the scientific works published in the last two decades converge in the thesis that Mexican higher education professors have medium–low levels of digital skills and that it is necessary to increase the training of university professors in digital matters and, specifically, in the integration of different digital tools in the teaching–learning process and in the achievement of the didactic objectives of each area [33,34]. Some studies identify that, in the case of Mexico, there are lower levels of digital competence than in other neighboring countries, such as Colombia, because there is less effort in terms of infrastructure and training [35]. Despite this, Mexico is at the head of the countries in the region in terms of the number of research publications on the virtualization of higher education [36]. On the other hand, there are works focused on Latin American higher education faculty, not necessarily Mexican, that assess as intermediate–low the level of general digital competence of faculty [28,37–40]; the literature suggests that the problem of faculty training in digital matters is endemic in the region and that the perception of skills for the use of VR is not necessarily lower than the assessment of general digital skills, although this should be verified in a subsequent study.

Regarding the assessment of VR tools, the results show that this rating is very high, both in didactic and technical aspects, even though the level of perceived disadvantages is intermediate (with a score slightly below 4 out of 5; Table 2). These results are in line with the previous literature on the assessment of VR didactic resources in higher education in the Latin American region [1,38] and on the benefits of VR use on the academic performance of university students [41]. The results are also in line with the perceptions expressed by professors in other geographical areas, such as Europe [42], where the motivation of students to learn is the main didactic advantage of VR, or Asia [43], where there is a greater emphasis on the increase that the use of VR causes in certain learning skills such as spatial vision. It has also been shown that the digital competence of Mexican professors positively influences the assessment of the technical characteristics of VR and this, in turn, influences the assessment of the didactic aspects of VR (Tables 3 and 4). These results confirm the idea that technical knowledge is linked to the assessment of didactic tools, although the integration of the latter into the dynamics of teaching is not completed solely based on knowledge of their technical characteristics [44]. Likewise, it is shown that Mexican professors identify difficulties and limitations for the didactic use of VR, mainly in terms of economic costs, the training required by professors, and the space required by the equipment necessary to use VR. The problem of costs, together with that of digital training, is the most present concern in the previous literature as a brake for the integration of VR in higher education [45,46], which has lead specialists to design low-cost VR tools to be applied in higher education [47] or to design plans and projects to support the integration of VR technologies in Latin American universities [48]. However, the literature also recognizes other specific limitations of VR, such as the space required [49]. The results are also in line with the perceptions of faculty at a more international level who find technological equipment requirements and teacher training to be important constraints to the integration of VR in higher education [25].

The main original and innovative results of the present work are those that identify differences in the assessments of VR according to the area of knowledge of Mexican professors. In this sense, the results identify a strong gap, mainly between Engineering and Humanities professors. Indeed, Engineering professors give very high ratings to the characteristics and didactics of VR and are those who claim to have greater digital skills and identify fewer disadvantages in the use of VR (Table 5). On the other hand, Humanities professors are those who express a lower level of digital competence, value to a lesser extent the technical aspects of VR, and detect a greater number of disadvantages in the didactic use of VR. The high ratings given by Engineering professors to VR technologies is something found in the literature [40,50]. The novelty here is to note how the assessment of the didactic use of VR is positively linked to the level of technological specialization of the professors, so that those who have, in principle, less technological specialization—Humanities professors—are the ones who offer lower ratings, at least in the case of Mexican professors.

Another novel and original contribution of the present study is the analysis of the behavior of the gender gap in the perceptions of Mexican professors about VR in each area of knowledge. Both in the more specifically technological area—Engineering—and in the areas of a humanistic–social nature—Humanities and Social Sciences—males report higher ratings than females, both of their own digital competence and of VR (Figure 6). In contrast, in the scientific areas—Sciences and Health Sciences—it is females who give higher ratings of VR than males (Figure 6). The digital gender gap among Latin American professors is an aspect that has been widely studied, and the literature shows that females generally fall behind males in digital competence [51], in access to digital technologies [52,53], and in the assessment of the didactic use of didactic tools such as VR [54]. The novelty of the results presented here is that they show that this gender gap is not homogeneous in the case of professors in Mexico but behaves differently with the area of knowledge, so that a more technological area does not necessarily lead to the gap being corrected. A subsequent qualitative exploratory study will be necessary to try to identify the reasons for this difference in behavior, and an extended quantitative study will be necessary to verify whether this is a specific Mexican phenomenon, or whether it is a global phenomenon in the region.

The results also show that the digital generation gap among Mexican professors in terms of their assessment of VR behaves differently depending on the area of knowledge. Thus, in both Engineering and Humanities, it is the digital immigrants who better value the technical and didactic aspects of VR, while in Sciences and Health Sciences, the digital natives value the didactic aspects of VR better than the digital immigrants (Figure 7). The literature had shown that the digital generation is an explanatory variable of digital competence [51] and of the ratings of the didactic use of VR, with digital natives being generally more inclined to use virtual tools [32,55]. The novelty here lies in showing that, once again, the behavior of this digital divide depends strongly on the area of knowledge, with digital natives only surpassing digital immigrants in their assessments of VR in the areas of Sciences and Social Sciences. Both in the more technical areas—Engineering—and in those, in principle, more distant from technology—Humanities—digital immigrants outperform digital natives in their ratings, which suggests the idea that technical training does not explain the behavior of this digital divide, at least not completely. Therefore, it is necessary to go deeper into identifying the reasons underlying these differences, starting with a subsequent exploratory study. On the other hand, in the area of Humanities, teachers find more disadvantages in the use of VR than in the rest of the areas. This may be because they perceive VR as less applicable to their discipline than to others of a more scientific–technical nature. The literature contradicts this perception [30,31]. As an implication of the study, the need follows to provide specific training in areas of a less technical nature in the specific use of digital technologies such as VR. Other implications of the study are the following: (i) in all areas of knowledge, the professors surveyed express a lower level of digital skills for the use of VR than their assessment of this technology as a didactic resource, which shows the need to train professors in their techno-pedagogical skills; and (ii) a digital divide persists, which shows the need to introduce corrective measures in universities aimed at favoring the integration of older professors.

5. Limitations and Lines of Future Research

The selection of the study participants, carried out in a non-probabilistic way by convenience among professors interested in the use of digital technologies and who signed up for the training session on VR, constitutes a limitation of the work. In future research, it would be advisable to carry out a probabilistic sample or, at least, to include in the study professors who are not necessarily interested in the use of these technologies. Likewise, the sample of participants presents certain biases by areas of knowledge and digital generation, so that carrying out a study that homogenizes the sample in these respects would serve to contrast the results obtained. Other lines of future research are the following: (i) to carry out a similar study in which the sample of participants is homogeneous by country, so that the differences by country of origin in the variables analyzed can be analyzed; (ii) to complete the results obtained with a qualitative study that helps to understand the reasons for the low ratings of digital skills or the reasons underlying the gaps identified; and (iii) to monitor the future use of VR by the participating professors and the influence that this use will have on their opinions.

6. Conclusions

University professors in Mexico report having, in general, deficient digital skills for the use of VR technologies in their lectures but give very high ratings to this tool from the technical and didactic points of view. These ratings differ according to the area of knowledge of the professors: Humanities professors are the ones who rate VR the worst, while specialists in technical education give the highest ratings to this tool—approximately 5% more in its technical aspects and approximately 20% higher levels of digital skills for its use.

There are gender and digital generation gaps in the perceptions of Mexican professors about VR, and these gaps behave differently according to the professors' area of knowledge. Specifically, among professors in Engineering, males give higher ratings than females of VR in both technical characteristics and its didactic applicability, while in Humanities, females rate the didactic use of VR higher than males. Among the professors of Humanities, Social Sciences, and Engineering, the digital immigrant professors value the didactic applicability of VR better, while in Sciences and Health Sciences, it is the digital natives who are more favorable to the use of these technologies in the development of their lectures. It is recommended that universities increase funding for digital technology equipment, especially VR, for teaching activities. Universities should also carry out training sessions on the didactic use of VR and for the development of techno-pedagogical skills of the teaching staff. These training sessions should be different according to the area of knowledge. Thus, considering the results obtained, professors of humanistic–social areas should reinforce their training in the technical aspects of VR, while professors of technical areas should reinforce their training in the didactic aspects. Finally, training in digital skills should especially facilitate female professors' access to and use of technologies.

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Appendix A

Table A1. Questions of the survey (all responses are given on a Likert scale from 1 to 5, where 1 means the lowest rating and 5 means the highest rating, in each case).

Subscales	Question
Rate the following aspects related to your perception of your own digital competence in using VR technologies	Level of knowledge about VR VR training received at your institution Assessment of your digital skills
Rate the following technical aspects of VR	3D Design User experience Usability Immersion degree Interaction Realism Didactic employability
Rate the degree to which each of the following may constitute a disadvantage of using VR technologies in the classroom	Costs Space Faculty training
Rate the following aspects about the usefulness and didactic employability of VR	Increased student attention Improvement in the progress of the subject Increased motivation Increased academic performance

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