Artículos científicos

Impacto de una estrategia b-learning en las competencias digitales y estilos de aprendizaje de estudiantes de enfermería

Impact of a B-Learning Strategy on the Digital Competences and Learning Styles of Nursing Students

Impacto de uma estratégia de b-learning nas habilidades digitais e estilos de aprendizagem de estudantes de enfermagem

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Resumen

El objetivo de este estudio fue implementar el uso del *b-learning* en un curso para analizar el impacto en las competencias digitales y los estilos de aprendizaje de los estudiantes de la licenciatura en Enfermería de la Universidad Autónoma de Querétaro. El estudio fue cuantitativo y cuasi-experimental. Se seleccionó un grupo de 54 estudiantes y la recolección de la información se efectuó en tres etapas: *1)* se realizó una preprueba mediante la aplicación del Cuestionario para el estudio de la Competencia Digital del Estudiante de Educación Superior (CDAES) y del Cuestionario Honey-Alonso sobre Estilos de Aprendizaje (Chaea); *2)* implementación del *b-learning* en un curso, y *3)* se efectuó la posprueba con el CDAES para conocer los efectos de la intervención. Los resultados muestran que el uso del *b-learning* impactó en las competencias digitales de los estudiantes. La mayor diferencia se logró en la Dimensión 1 (Alfabetización tecnológica) y en la Dimensión 4 (Comunicación y colaboración). Según el género, sin contar un par de excepciones, no existe una diferencia significativa en la comparación de competencias digitales. El impacto más considerable en las competencias digitales lo presentan las mujeres en la Dimensión 1 (Alfabetización tecnológica) con un promedio de 15 unidades. El análisis de regresión lineal múltiple mostró la existencia de una relación entre ser mujer, los años de uso de la computadora y la Dimensión 6 (Creatividad e innovación) posintervención. El estilo de aprendizaje predominante en las mujeres fue el reflexivo (52.6 %) y en los hombres este (25 %) y el reflexivo-pragmático (25 %). Del estudio se puede concluir que el *b-learning* favorece el desarrollo de competencias digitales, así como la adopción de otros estilos de aprendizaje. Además, promueve gradualmente el trabajo colaborativo de los estudiantes. Finalmente, las instituciones de educación superior para la formación de recursos de enfermería deben elaborar un plan integral que incluya un diagnóstico de competencias digitales y estilos de aprendizaje para la adopción de un uso efectivo y equitativo de la tecnología digital.

Palabras clave: *b-learning*, competencia digital, enseñanza superior, estilos de aprendizaje, estudiantes de enfermería.

Abstract

The objective of this research was to implement the application of b-learning in a course to analyze the impact on the digital competencies and learning styles of students of the Bachelor of Nursing at the Universidad Autónoma de Querétaro. The study was a quantitative and quasi-experimental level. A group 54 of nursing students was selected. The collection of information was done in three stages: *1)* A pre-test was carried out, by means of the application of the questionnaire for the study of the Digital Competence of the Student of Higher Education (CDAES) and the application of the Learning Styles Questionnaire of Honey-Alonso, *2)* By four months, b-learning was implemented in a course of the nursing program with a group, and *3)* At the end of the period, the post-test was carried out by applying the CDAES to know the effects. The results show that the use of b-learning impacted the digital competences of the students. The biggest difference was in Dimension 1 (Technological Literacy), followed by Dimension 4 (Communication and collaboration). There is not a strong correlation between the study dimensions. The highest correlation was obtained in the dimensions: 3 (pre intervention), 5 (post intervention) and 4 (pre and post intervention). In the gender aspect, leaving aside a couple of dimensions, there is not significant difference in the comparison of digital competences. The most considerable impact on digital competences is presented by women in Dimension 1 (Technological Literacy) with a value of 15 units. Multiple linear regression analysis showed the existence of a relationship between being a woman, years of computer use, and Dimension 6 (Creativity and innovation) in post intervention. The predominant learning style was reflexive in women (52.6 %) and reflexive (25 %) and reflexive-pragmatic (25%) in men. From the study it can be concluded that b-learning is a model that facilitates the development of digital competences as well as the adoption of other learning styles. Also, b-learning gradually promotes collaborative work in students. Finally, it is established that institutions of higher education for nursing resources must elaborate a comprehensive plan that includes a diagnosis of digital competences and learning styles within institutions to adopt an effective and equal use of digital technology.

Keywords: b- learning, digital competence, higher level education, learning styles, nursing students.

Resumo

O objetivo deste estudo foi implementar o uso do b-learning em um curso para analisar o impacto nas habilidades digitais e nos estilos de aprendizagem de alunos do curso de Enfermagem da Universidade Autônoma de Querétaro. O estudo foi quantitativo e quase experimental. Foi selecionado um grupo de 54 alunos e a coleta de informações foi realizada em três etapas: 1) foi realizado um pré-teste aplicando o Questionário para o estudo da Competência Digital do Aluno do Ensino Superior (Questionário para o estudo do) e o Questionário Honey-Alonso sobre Estilos de Aprendizagem (Chaea); 2) implementação do b-learning em um curso; e 3) o pós-teste foi realizado com o Questionário para o estudo de Competência para conhecer os efeitos da intervenção. Os resultados mostram que o uso do b-learning impactou nas habilidades digitais dos alunos. A maior diferença foi alcançada na Dimensão 1 (Alfabetização Tecnológica) e na Dimensão 4 (Comunicação e colaboração). De acordo com o gênero, sem contar algumas exceções, não há diferença significativa na comparação de habilidades digitais. O impacto mais considerável nas competências digitais é apresentado pelas mulheres na Dimensão 1 (literacia tecnológica) com uma média de 15 unidades. A análise de regressão linear múltipla mostrou a existência de relação entre ser mulher, anos de uso do computador e a Dimensão 6 (Criatividade e inovação) pós-intervenção. O estilo de aprendizagem predominante nas mulheres foi reflexivo (52,6%) e nos homens este (25%) e reflexivo-pragmático (25%). A partir do estudo pode-se concluir que o b-learning favorece o desenvolvimento de habilidades digitais, bem como a adoção de outros estilos de aprendizagem. Além disso, gradativamente promove o trabalho colaborativo dos alunos. Finalmente, as instituições de ensino superior para a formação de recursos de enfermagem devem desenvolver um plano abrangente que inclua um diagnóstico de competências digitais e estilos de aprendizagem para a adoção de um uso eficaz e eqüitativo da tecnologia digital.

Palavras-chave: b-learning, competência digital, ensino superior, estilos de aprendizagem, estudantes de enfermagem.

Introduction

At present, the implementation of educational technology in higher education is widespread and the areas of university training in which it is used are diverse. Depending on the characteristics of the educational programs, use is made of educational platforms, websites, applications, devices, augmented reality, gamification, transmedia, wikis, social networks, podcasts, and e-learning models. Within the latter, blended learning (b-learning) is on the rise.

B-learning

The term blended refers to the interaction of two learning modalities. Because of this, it is also known as blended, blended, hybrid, bimodal, and blended learning. B-learning is a model that focuses on learning processes combining face-to-face teaching with educational technology (Bartolomé, 2004; Llorente, 2008; Marsh, McFadden and Price, 2003).

B-learning arises from the need for companies to flexibly train a greater number of employees at low cost. In this way, the objectives of the organization are met and, at the same time, a productive environment is established for the workers.

With this modality, the obstacles that virtual education posed at the time both in terms of connectivity and isolation were being overcome (Brennan, January 2, 2004; Young, March 22, 2002). Through the use of digitized texts delivered, either on CD-ROM, or previously downloaded before leaving the company, it was not necessary to connect to the Internet at home and it was possible to continue training asynchronously.

B-learning does not imply the use of a specific theoretical reference. In reality, it implies the use of various theoretical references: behaviorism, cognitivism, humanism and constructivism, whose precepts are used depending on the learning process, the objectives or competencies of the students to whom it is addressed, as well as human resources and digital media available (Bartolomé, 2008). In fact, in the learning process, various methods, resources and strategies have been used since ancient times; only that online work and the elements that information and communication technologies (ICT) integrate were not used.

The main characteristics of b-learning are related to the harmonious use of the classroom and the Internet, with the aim of improving student learning. According to

Bartolomé and Aiello (2006), Cabero and Marín (2018) and Horn and Staker (2011), some of these characteristics are:

- Integrates the benefits of face-to-face learning, with the benefits of distance education: asynchrony and multiple essays.
- Improves the digital skills of teachers and students.
- It enables the creation of flexible pedagogical spaces according to the characteristics of the students.
- Establishes various communication channels that fulfill different functions: construction of learning spaces, for organizing time and activities, for interaction, and they are the way to access learning resources.
- It facilitates collaborative and cooperative work, the promotion of values and, at the same time, the search for autonomy and independence of students.
- Improves educational indicators and lowers operating costs.
- It allows incorporating a wide variety of digital resources, depending on the learning objectives and the students.

However, it is necessary to emphasize that some principles of educational design must be taken into account (Díaz, 2005) for the systematized planning of learning mediated by the blended modality:

- Cooperative and collaborative work should be aimed at solving problems of daily life and of social relevance.
- Teaching must be organized in open learning environments, in which critical thinking is encouraged and the student has the possibility to propose and choose.
- Flexible and alternative scenarios should be established through the use of instructional systems that are continuously updated and based on the progress and needs of the student.
- It is necessary to apply an evaluation that seeks to identify complex socio-emotional competencies. That is, skills and attitudes that lead to self-regulation.

Digital skills

Digital competences are the knowledge, skills and attitudes that enable the use of applications, digital devices, networks and elements of communication to obtain information and manage its use for solving problems in life, work and for collaboration with others in a social context (United Nations Educational, Scientific and Cultural Organization [Unesco], March 15, 2018).

The International Society for Technology in Education [ISTE] (2016) proposed seven dimensions that should be promoted so that students acquire a series of competencies that promote the appropriate use of educational technology: 1) Empowered learning, 2) Digital citizenship, 3) Knowledge Builder, 4) Innovative Designer, 5) Computational Thinker, 6) Creative Communicator, and 7) Global Contributor. For students to acquire these competencies, it is necessary for higher education institutions to carry out comprehensive work within the academic cloisters. Furthermore, it should be mentioned that it is not enough to acquire essential financial and technological resources.

Particularly, in the field of health, it is essential that students acquire the following six digital competencies to have a professional development that improves the care of the population: 1) Literacy in digital health, 2) Effective management of scientific-health information, 3) Health communication, 4) Creation of scientific-health digital content, 5) Collaborative network work with health teams and 6) Analysis and data management (Montero, Merino, Monte, Ávila and Cepeda, 2019). To achieve this, it is necessary to determine the levels of digital competencies that students possess when entering a higher level.

Background

In investigations carried out, it has been noted that the authorities promote the development of hybrid training means and devices, but this practice is not yet widespread. Universities recognize the need to support teachers technically and pedagogically, but actions are only aimed at generating a virtual space, which is generally used as a repository and email for sending and receiving work. The communication of the teacher to the student by technological means is scarce (Costa, Celis, Castillo and Espinoza, 2019; Islas, 2015).

However, when digital media are used for teacher training, it has been found that they obtain more time available and, consequently, can provide better service to students (Salinas, 2019).

The low use of the b-learning model (or its failure) is determined, on multiple occasions, by the absence of a diagnosis that allows knowing the needs of students and teachers with respect to the skills previously acquired for the use of educational technology; due to the lack of educational planning that comes from the extensive knowledge of the teachers regarding the educational program, and due to the lack of a detailed and appropriate design for the learning that is desired (Posey and Pintz, 2017).

The lack of studies that favor pedagogical analysis and evaluation of the implementation of the use of educational technology leads to confusion among users and a lack of interest in assimilating it. Usually, it ends up being adopted, not in its entirety, to obtain accreditation of the educational program. The adoption of a b-learning model, by teachers and students, requires the review of digital literacy processes. This involves conducting studies that address the participation factors that influence the adoption of combined models (Alfayoumi, 2019; Olelewe, Agomuo, and Uzochukwu, 2019; Yung, Hang, Yin, Minghui, and Kuen, 2018). Not all the factors that influence the incorporation of a digitized educational model partially or totally depend on the institution.

There are extra-institutional factors that may be more determining than the lack of infrastructure and equipment, the inadequate implementation of the curriculum, and the absence of a culture of appropriation of educational technology. It has been documented that virtual education is considered ineffective and of lower quality. Some of the people who access this type of program do not have reading habits or self-taught and independent study, and there is a belief that they must have extensive knowledge and use of ICT to be successful (De Arco, Barceló and Parra, 2017).

The gender difference in students is also pointed out as an influencing factor. Women have little presence in the use of advanced digital resources and more interest in relational and collaborative aspects on the Internet (Sallé, 2012). In Latin America, the stereotype attributes to the male student more favorable conditions for the acquisition of skills, despite the absence of vast scientific evidence to support it (Cervantes, 2019).

It was also found that men and women consider that they, men, are better in their attitude and use of computers (Francis and Katz, 2006). In contrast, networking, the use of

applications productively and collaboratively, as well as the digital ethical competencies they possess, is more effective in women (Arras, Torres and García, 2011). In a systematic review it was shown that in higher education most of the programs that develop digital competencies and skills in women are directed towards engineering for a better acquisition of technology (Prendes, García and Solano, 2020). Consequently, a great effort is required on the part of higher education institutions to address the inequity that exists in the use of educational technology.

In addition to the above, they consider that the availability of state-of-the-art equipment and high-speed connectivity at home is essential, as well as the time necessary to acquire digital skills in a formal or informal way to be applied in the achievement of the objectives of established learning (Paredes, 2019).

The incorporation of educational technology, in addition to collaborative work and student interaction, is very overwhelming for some teachers. The use of educational technologies or platforms in teaching becomes a challenge. In reality, ICTs are a resource for the student to access knowledge through the teacher's mediation (Gómez, Alemán de la Garza and Figueroa, 2019). In this model, the teacher guides, leads and reinforces the different communication channels that have been articulated from a didactic design that supports the learning process.

In this regard, students refer in research on b-learning the lack of relationship between virtual content and face-to-face classes, the irregularity in online publications and their updating, as well as the lack of monitoring, follow-up and attention online and in a formal way. face-to-face (Tosun, 2015; Vásquez, 2017). This leads the student to express their dislike and apathy to work with this model and prefer more predictable scenarios, such as face-to-face classes, instead of venturing through an independent and uncertain work. They are usually used to interacting digitally with each other, but not for learning, only for socializing and for recreation (Creer, 2018).

Research indicates that most of the teachers who use educational technology to implement a b-learning model have limitations: they have not been updated and the use of digital resources is limited and not very creative, traditional teaching continues to permeate the content and not There is concern about generating meaningful learning, in addition to the students pointing out that the teachers do not give them feedback (Carranza, 2017). Few

teachers use wikis, blogs, forums, platforms, and application software in innovative ways to convey their program content. The evaluation of the students is still linear; teachers do not consider self-evaluation or co-evaluation (Núñez, Monclúz & Ravina, 2019).

B-learning, despite being a very widespread learning modality known by higher education, still presents important challenges to solve. The 2019 Horizon report (Alexander et al., 2019) states that support is required to design learning experiences that make the most of digital platforms and, at the same time, to expand their pedagogical repertoire by including collaboration and learning design student-centered.

In implementing b-learning, students feel secure in being able to access the materials over and over again for reference. This resource allows, at the same time, to repeat countless times the performance of exercises or practices to improve performance, coupled with allowing the approach and improve the use of ICT, which is very useful in the nursing area. However, the students also pointed out that one of the disadvantages of this model is the lack of face-to-face interaction when the discussion groups or forums are held (McCutcheon et al., 2018; Rahman, Hussein & Aluwi, 2015) . In particular, for the training of nurses it is essential to foster skills for the development of empathy and interpersonal relationship when care is carried out.

According to the report of studies carried out, the b-learning model is highly effective and enables more students to access knowledge even when infrastructure and geographical conditions do not allow it. Although in the case of nursing training, it is not considered that this can totally replace the face-to-face teaching model given the nature of the profession (Balasubramaniam et al., 2018). Regarding this point, the findings of a meta-analysis show that when comparing the effectiveness of the flipped classroom to improve the academic performance of nursing students with other strategies, such as b-learning, the experimental group showed a no effect as a consequence of the use of the flipped classroom (Sola, Aznar, Romero and Rodríguez, 2019). That is, it requires the situation that places the student face to face with reality, as well as facing the sensations, cognitions and behaviors generated by the interaction with people.

Generally, in digital learning models the learning style of students is not diagnosed to adapt the objects and learning strategies to them (Pulido, 2017). Students must generate strategies that allow them to collect, analyze and process the information that is housed in

the learning platform in an unconventional way, different from what they are used to with the traditional teaching model.

The need to promote active and dynamic learning environments should be highlighted. This is: not only combining the face-to-face with the virtual, but also inducing the participation of students through collaborative strategies that generate interactive and decisive learning styles (Coyne, Frommolt, Rands, Kain and Mitchell, 2018; Osorio and Castiblanco, 2019). A mixed modality study reflected that there is a low relationship between the strategies planned by the teacher in the instructional design and the development of skills for problem solving in students (González, 2018). Therefore, the importance of structuring strategies that allow the student to learn to solve problems and this generates confidence in their learning.

Students' learning styles change when they are immersed in the use of b-learning, since they have to adapt to the conditions posed by the use of a combined method. It has been reported that students develop, with the use of b-learning, proactive and socio-constructivist attitudes that accommodate different learning styles (Belmonte, Sánchez and Guerrero, 2019; Plemmons, Clark and Feng, 2018).

When studying the influence of learning styles with online search processes, the findings showed that students tend to proceed based on their preferences. Those with a reflective style generally always have the same way of solving despite the task (Hernández, Serate & Campos, 2015). A study carried out with veterinary students to relate learning styles and academic performance showed that the reflective style is related to high performance (Pavón and Leyva, 2018).

For their part, the study by Jiménez, González and Garay (2018), carried out with nursing students to determine the relationship between learning style and academic performance in a b-learning model, indicated that there is a correlation between reflective style , theoretical and pragmatic with academic performance. Due to the practical nature of nursing, students adopt learning styles that lead them to observation, analysis, and methodical work rather than discovery and experimentation (Li, He, Yuan, Chen & Sun, 2019). However, González, Hernández and Castrejón (2018) reported that the style most used by nursing students in higher education is active. Undoubtedly, more mixed studies are required

to explore the perception and the way in which learning styles are adopted according to the contents and the educational modality.

It is also important to consider that the socioeconomic characteristics of the context and of the students themselves, particularly nursing, lead students to enroll in the work environment early. For those part-time students, who find it impossible to complete the educational program exclusively in person, the model here in question offers them the possibility of completing their studies and, in addition, acquiring skills that will be useful for their professional life (González, Karen, Perdomo, Yois y Rengifo, 2017; Leidl, Ritchie y Moslemi, 2020).

However, the design of this model implies overcoming not only technological aspects, as has already been mentioned; It is even necessary to face the perception that students and teachers have of teaching. Thus, having a digital platform in the institution is not enough to ensure success in the use of this hybrid modality. The difference in instructional designs, learning objects and their systematization have considerable effects (Salinas, De Benito, Pérez & Gisbert, 2018; Vo, Zhu & Diep, 2017).

This article presents the results of the quantitative phase of a quasi-experimental study that was conducted with nursing students from a higher education institution. The purpose of the study was to analyze the impact of a b-learning strategy on the competencies and learning styles of nursing students.

Materials and methods

To achieve the research objective, a quasi-experimental design with a quantitative approach was used. A group of 54 students of the degree in Nursing of the Autonomous University of Querétaro was selected.

The study consisted of three stages. In the first, the group was informed about the purpose of the research and all the information concerning the study was provided. The informed consent letter, which ensures the confidentiality of the data and the right to withdraw from the study at will, was signed by all participants. Next, the application of the pre-test of the Questionnaire for the study of the Digital Competence of Higher Education Students (CDAES) (Gutiérrez, Cabero and Estrada, 2017) and the Honey-Alonso Questionnaire on Learning Styles (Chaea) (Alonso, Gallego, Honey, 2007). In the second

stage, the intervention began with training for the use of the university's virtual Moodle platform, and was oriented on the use of digital tools and applications for the implementation of the course. In addition, the instructional design and the skills expected to be obtained were made known. The duration of the course was four months, with four contact hours per week, and through the platform activities were carried out alternately. During that time, feedback was provided (in person, through the forum, email and cell phone use) and adjustments were made to the instructional design based on the detected and manifest needs. Finally, in the third stage, the post-test was applied to know the effects of the use of b-learning on the competences and learning styles of the students.

The descriptive and inferential statistical analysis of the information was carried out using the Statistical Package for the Social Sciences (SPSS V22) program. The interpretation of the data was carried out to identify the characteristics of the sociodemographic variables, the distribution of the CDAES data, the comparison of digital skills, the relationship between learning styles according to gender, and the comparison of pre and post intervention skills.

Results

A total of 54 students completed the three stages of the study. Of these, 41 were women (76%) and 13 were men (24%). The mean age was 19.89 ±. Regarding the place of residence of the students, 68% lived in the same city where they studied; the rest came from less populated localities with less infrastructure (they return home on weekends or during vacation periods). In relation to the high school of origin, 74% came from a public institution and the rest from a private institution.

However, 67% had portable computer equipment, 18.5% desktop and 3% none. Regarding connectivity at home, only 93% had access. Mobile connectivity was only owned by 81%. When inquiring into the number of hours spent a week on the computer, it was found that 43% used more than one hour and up to five; in contrast, 9% spent more than 20 hours. For the use of the computer, 52% had received information from computer programs for word processing, 20% had basic computer knowledge, 20% had knowledge of programs and software, 6% used specific software in their area and 2% had not received Any information. Regarding the usefulness of educational technology to improve their school performance, 50% fully agreed and 4% did not.

With respect to the data obtained, all the responses attributed to the dimensions follow a normal distribution, except in Dimension 3 (Critical thinking) in the pre-intervention, for women 0.000 and for men 0.024. It is observed that there is a dispersion in the responses of both. Likewise, in Dimension 1 (Digital Literacy), in the post-intervention, 0.000 for women and 0.039 for men, dispersion is shown in both sexes. Furthermore, in the post-intervention, the women's responses in all dimensions denote dispersion (see Table 1).

Tabla 1. Análisis de la distribución de los datos

Dimensiones inicial	Sexo	Shapiro-Wilk Sig.
D1. Alfabetización tecnológica	Mujer	0.076*
	Hombre	0.222*
D2. Búsqueda y tratamiento de la información	Mujer	0.395*
	Hombre	0.348*
D3. Pensamiento crítico	Mujer	0.000
	Hombre	0.024
D4. Comunicación y elaboración	Mujer	0.518*
	Hombre	0.891*
D5. Ciudadanía digital	Mujer	0.144*
	Hombre	0.615*
D6. Creatividad e innovación	Mujer	0.470*
	Hombre	0.623*
Dimensiones final	**Sexo**	**Shapiro-Wilk Sig.**
D1. Alfabetización tecnológica	Mujer	0.000
	Hombre	0.039
D2. Búsqueda y tratamiento de la información	Mujer	0.000
	Hombre	0.841*
D3. Pensamiento crítico	Mujer	0.000
	Hombre	0.499*
D4. Comunicación y elaboración	Mujer	0.001
	Hombre	0.290*
D5. Ciudadanía digital	Mujer	0.002
	Hombre	0.456*
D6. Creatividad e innovación	Mujer	0.028
	Hombre	0.192*

* Conjunto de datos que siguen una distribución normal.

Fuente: Elaboración propia

When comparing men and women by dimension using the Student's t test for independent groups, there is no difference between the groups before or after the intervention, except in Dimension 6 (Creativity and innovation) in the 0.040 post-intervention. Likewise, it can be seen in Table 2 that women present better post-intervention digital skills in all dimensions compared to men. The greatest difference is found in Dimension 2 (Search and treatment of information) and Dimension 6 (Creativity and innovation). Additionally, the greatest advance in digital skills was presented by women in Dimension 1 (Technological literacy), with an average of 15 units of advance between the initial and final measurements; the greatest progress that men presented was in Dimension 4 (Communication and collaboration) with an average of 13 units.

Tabla 2. Comparación de competencias digitales según género

Preintervención					
Dimensiones	**Mujer**		**Hombre**		***p*** *
	$[\bar{\mathrm{X}}\ (s)]$	IC a 95 %	$[\bar{\mathrm{X}}\ (s)]$	IC a 95 %	
D1. Alfabetización tecnológica	[80.05 (18.62)]	74.17 – 85.93	[89.23 (22.64)]	75.55 – 102.91	0.148
D2. Búsqueda y tratamiento de la información	[43.66 (9.47)]	40.67 – 46.65	[44.23 (10.05)]	38.16 – 50.30	0.852
D3. Pensamiento crítico, solución de problemas y toma de decisiones	[27.61 (7.04)]	25.39 – 29.83	[27.62 (5.51)]	24.28 – 30.95	0.998**
D4. Comunicación y colaboración	[58.12 (13.04)]	54.01 – 62.24	[54.23 (15.57)]	54.82 – 73.64	0.166
D5. Ciudadanía digital	[41.39 (10.16)]	38.18 – 44.60	[41.00 (9.59)]	35.20 – 46.80	0.903
D6. Creatividad e innovación	[51.71 (9.59)]	48.68 – 54.73	[49.15 (11.20)]	42.38 – 55.92	0.425
Posintervención					
Dimensiones	**Mujer**		**Hombre**		***p*** *
	$[\bar{\mathrm{X}}\ (s)]$	IC a 95 %	$[\bar{\mathrm{X}}\ (s)]$	IC a 95 %	
D1. Alfabetización tecnológica	[94.98 (14.86)]	90.28 – 99.67	[93.46 (17.94)]	82.62 – 104.30	0.786**
D2. Búsqueda y tratamiento de la información	[50.61 (8.48)]	47.93 – 53.29	[45.69 (7.57)]	41.11 – 50.27	0.068
D3. Pensamiento crítico, solución de problemas y toma de decisiones	[32.22 (5.70)]	30.42 – 34.02	[29.54 (4.97)]	26.53 – 32.55	0.135
D4. Comunicación y colaboración	[68.29 (12.86)]	64.23 – 72.35	[67.62 (9.46)]	61.90 – 73.34	0.862
D5. Ciudadanía digital	[47.49 (7.69)]	45.06 – 49.92	[45.85 (6.59)]	41.86 – 49.83	0.492

D6. Creatividad e innovación	[57.93 (7.80)]	55.46 – 60.39	[52.92 (6.29)]	49.12 – 56.72	*0.040*

* t de Student para grupos independientes.

** No se asumen las varianzas iguales mediante prueba de Levene.

Fuente: Elaboración propia

On the other hand, the correlations between dimensions were carried out using Pearson's r test when there was a normal distribution of the data; Spearman in the opposite case. It was found that there is no marked correlation between the study dimensions; the highest is the one presented by Dimension 3 (pre-intervention), Dimension 5 post-intervention and Dimension 4 (pre and post-intervention). The above reflects a relationship between digital skills before and after the intervention (see table 3).

Tabla 3. Correlaciones entre dimensiones de competencias digitales

Preintervención		Posintervención					
		D 1	D 2	D 3	D 4	D 5	D 6
D1	Correlación de Pearson	0.266*	0.080	0.057	0.221	0.153	0.090
	Sig. (bilateral)	0.052	0.565	0.681	0.108	0.268	0.519
D2	Correlación de Pearson	0.143*	0.203	0.173	0.286	0.320	0.249
	Sig. (bilateral)	0.302	0.141	0.212	0.036	0.018	0.069
D3	Correlación Spearman	0.118	0.164	0.216	0.388	0.448	0.362
	Sig. (bilateral)	0.394	0.235	0.117	0.004	*0.001*	0.007
D4	Correlación de Pearson	0.364*	0.235	0.259	0.433	0.382	0.245
	Sig. (bilateral)	0.007	0.087	0.059	*0.001*	0.004	0.074
D5	Correlación de Pearson	0.124*	0.204	0.260	0.363	0.398	0.282
	Sig. (bilateral)	0.370	0.139	0.057	0.007	0.003	0.039
D6	Correlación de Pearson	0.034*	0.168	0.188	0.228	0.372	0.358
	Sig. (bilateral)	0.807	0.225	0.173	0.098	0.006	0.008

* Correlación de Spearman por presentar una distribución no normal en alguna de las

dimensiones.

Fuente: Elaboración propia

Regarding learning styles according to gender, it was found that 52.6% (20) of women have a predominantly reflective style. While men, 25% (3) have the reflective style and, at the same time, 25% (3) the combination of the reflective-pragmatic style (see table 4).

Tabla 4. Relación entre estilos de aprendizaje según género

Estilos de aprendizaje	Género				Total	
	Mujer		Hombre			
	n	%	*n*	%	*n*	%
Activo	3	7.9	0	0	3	6
Reflexivo	20	52.6	3	25	23	46
Teórico	6	15.8	2	16.7	4	8
Pragmático	2	5.3	2	16.7	4	8
Reflexivo y pragmático	1	2.6	3	25	4	8
Teórico y pragmático	2	5.3	0	0	2	4
Activo y pragmático	1	2.6	2	16.7	3	6
Activo y teórico	1	2.6	0	0	1	2
Activo, reflexivo y pragmático	1	2.6	0	0	1	2
Activo, reflexivo, teórico y pragmático	1	2.6	0	0	1	2
Total	38	100	12	100	50	100

(ji al cuadrado, $p = 0.114$)

Fuente: Elaboración propia

To determine the effect of the pre and post-intervention, the Student's t test was used for repeated measures and differences were found between all study dimensions. The biggest difference fell on Dimension 1 (Technological literacy), followed by Dimension 4 (Communication and collaboration) (see table 5).

Tabla 5. Comparación de competencias antes y después de intervención

	Competencias digitales Preintervención [$\bar{x}$ (s)]	Competencias digitales posintervención [$\bar{x}$ (s)]	Diferencia promedio	$p*$
D1. Alfabetización tecnológica	[82.26 (19.83)]	[94.61 (15.49)]	12.35	0.000
D2. Búsqueda y tratamiento de la información	[43.80 (9.52)]	[49.43 (8.47)]	5.63	0.001
D3. Pensamiento crítico, solución de problemas y toma de decisiones	[27.61 (6.66)]	[31.57 (5.61)]	3.96	0.000
D4. Comunicación y colaboración	[59.59 (13.79)]	[68.13 (12.05)]	8.53	0.000
D5. Ciudadanía digital	[41.30 (9.94)]	[47.09 (7.41)]	5.79	0.000
D6. Creatividad e innovación	[51.09 (9.95)]	[56.72 (7.71)]	5.63	0.000

* t de Student para medidas repetidas.

Fuente: Elaboración propia

A multiple linear regression analysis was performed to evaluate if any of the study variables influenced the outcome of any of the dimensions; Several models were tested and the one that presented the best fit showed the existence of a relationship between the variables that is explained by the following equation:

$$Y = 43.909 + 5.205X_1 + 2.441X_2$$

Where Y is Dimension 6 (Creativity and post-intervention innovation), X1 is female and X2 is years of computer use. The coefficient of determination was 0.102 and the standard error of the estimate was 7.313. Table 6 shows the standardized coefficients and their

probability values. Therefore, being a woman and years of computer use explain 10% of the results in Dimension 6 (Creativity and innovation) post-intervention.

Tabla 6. Análisis de regresión lineal

	B	**Error estándar**	**Beta estandarizado**	**p-valor**
Constante	43.909	5.292	-	-
Mujeres	5.205	2.330	.291	.030
Años de uso de la computadora	2.441	1.324	.240	.071

Fuente: Elaboración propia

Discussion

There are still factors that represent an obstacle to the adequate implementation of a b-learning model in nursing students of higher education. In this study it was identified that only 9% of students use the computer and the Internet for academic purposes. Only 20% have knowledge of programs and software. Only 6% use software specific to their area. These data suggest that there is a lack of digital skills and competencies applied to the school context. In addition, only 67% have a laptop and 81% have a mobile connection to carry out their activities. The studies by Paredes (2019) and Posey and Pintz (2017) also identified these limiting factors.

The inferential tests to verify the effect between pre and post intervention showed that the use of the b-learning model impacted on the competences of nursing students applied to learning. Differences were found in all dimensions. However, the greatest difference was located in Dimension 1 (Technological Literacy), followed by Dimension 4 (Communication and collaboration). The change in students' competencies after having used b-learning was also identified in other studies (Balasubramaniam et al., 2018; Baltazar et al., 2019; Cerón, Gómez and Ábrego, 2014; Gutiérrez et al., 2017; Rossiter and Day, 2016; Wikander and Bouchoucha, 2018).

Regarding the comparison of digital competences according to gender, there is no significant difference, except for Dimension 2 (Search and treatment of information) and Dimension 6 (Creativity and innovation), since this is where the greatest difference was located . It should be noted that the most considerable impact on digital skills is presented by women in Dimension 1 (Technological literacy) with an average of 15 units of progress between initial measurement and final measurement. This can be attributed to the fact that 76% of the participating students were women, which can be considered as one of the study's limitations. It is feasible to think that women, in this study, showed a better use of ICT through their creativity and care to generate and complete a job, which is contradicted by the study carried out by Romero, San Martín and Peirats (2018) , in which men scored better on personalization, creativity, critical thinking, and simple storage.

As in the study by Jiménez et al. (2018) and Pavón and Leyva (2018), here the predominant style of women turned out to be reflective, while in men the reflective one was mainly identified and, to the same extent, the reflective-pragmatic one. However, there was divergence with respect to the findings of González et al. (2018), which indicates that the predominant style is the active one. Both women and men have another alternative learning style that they use according to the assigned task, but one always stands out (Hernández et al., 2015).

One of the identified weaknesses, regarding the identification of the learning styles of the students in this study, was not having carried out the post-test in the application of the Chaea; this could have statistically demonstrated the adoption of other learning styles.

Conclusions

The use of b-learning had an impact on the digital skills of nursing students. The acquisition of knowledge and skills for the use of educational technology through this model enabled students to comply with the activities proposed in the instructional design of the course. The predominant reflective learning style allowed women to improve their digital skills. The results of the post-intervention reflected that women make use of their creativity and innovation in the application of ICT for the preparation of their academic tasks. While the reflective and reflective-practical predominant style of men leads them to quickly resolve the fulfillment of these.

It is important to carry out a diagnosis of digital competences and leadership styles at the beginning of the course. With this, the necessary adaptations can be made for the benefit of the students and the achievement of the proposed competencies. It is also advisable to know the extra-institutional factors that affect the student for the use of educational technology: availability of equipment, connectivity, computer training background, time availability and socio-cultural context. In the implementation of a b-learning model, educational institutions need to raise awareness about the adoption of an equitable digital culture. The allocation of resources and the establishment of a policy are not enough.

It is necessary to carry out mixed and qualitative studies, in this and other areas of education, which allow to identify the way in which the members of an educational community, but especially the students, women and men, adapt their learning style for the acquisition of digital skills.

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