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# THE RELATIONSHIP BETWEEN SOCIAL PRESENCE AND PERCEIVED LEARNING IN A VIRTUAL TEACHING-LEARNING ENVIRONMENT

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**Abstract**

The present work studies the psychometric properties of the Spanish version of the measure of social presence in Harms and Biocca (2004) minds of network (Networked Minds Social Presence Measure) in a sample of 94 university students in Arica, Chile, who make use of virtual teaching and learning environment VLE UTA[med]. Reliability and an exploratory factor analysis were conducted with principal components and varimax rotation, and subsequent confirmatory factor analysis. The results show the existence of five subscales with a total of 23 items that explain 81.25% of the variance, a Cronbach's alpha of 0.94, and an adequate adjustment of the model. Additionally, the study confirms a positive relationship between social presence and perceived learning. The study allows us to have a shorter instrument, and adapted to the measurement of social presence in virtual environments for teaching and learning with better results well compared to the existing instruments.

**Keywords:** social presence; teaching learning virtual environment; theory of mind network

## Introduction

The transition from face-to-face to virtual, the use of electronic books, the annexation or substitution and enhancement of real laboratories with virtual and remote ones, and the use of digital resources in general, are increasingly used in

daily practice in education. The forms that these resources take are varied: from the conception of *Open Course Ware* , through educational video channels on YouTube and similar services, as well as repositories of learning objects or e-learning or b-learning courses generally based on on learning platforms.

Currently, the requirements of the new generation of learners (digital natives) demand that teachers develop digital skills and properly manage their pedagogical practices. The above poses some challenges: what materials or online resources could be introduced into your courses? What parts of the courses could be supported with these materials and how to do it so that their characteristics can be used to promote student learning? The use of virtual teaching-learning environments (EVEA) are an alternative because they harmoniously combine the technological and the pedagogical.

In parallel, the emergence of *social networks* on the Internet and EVEA have undergone a radical transformation, becoming widely used tools to facilitate and improve *teaching-learning processes.* Social interaction is one of its basic pillars (Kiser, 1999; Limniou & Smith, 2010; Uzunboylu, Bicen & Cavus, 2011) since these platforms not only guarantee control of the learning process, but also explicitly contemplate tools that favor the relationship between people (Robertson, 2002).

Social networks are considered virtual communities. Domenech, Tirado and Vayreda (2005), however, state that it cannot be said that in-person and virtual communities are equal, nor is it possible to argue that one is better than the other.

As Cabero (2006) explains, there is talk of a digital community, a telematic community, etc., but regardless of the name used, it seems clear that networks create a social interaction between people that is interesting to address.

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From a constructivist and socio-cultural perspective of learning, social interaction is considered one of the fundamental elements for the development of higher cognitive processes (Vygotsky, 1987); Hence, learning is understood as a social phenomenon through which students acquire the necessary elements to appropriate knowledge through interaction with their peers, teachers and the material. The EVEA precisely allow collaborative learning based not so much on the transmission of knowledge, but on its construction through sociocultural interaction, so that individuals become active agents in the learning process and are not limited to absorbing information, but rather they connect it with previously acquired knowledge in order to build their own.

A Virtual Learning Environment (VLE), also called Virtual Teaching-Learning Environment (EVEA) "is a computer application designed to facilitate pedagogical communication between participants in an educational process, whether completely remote, in-person, or of a mixed, which combines both modalities in various proportions" (Adell, Castellet & Pascual, 2004, p.4). These platforms serve to distribute educational materials in digital format (text, images, audio, simulation, games, etc.) and carry out online discussions or integrate relevant content from the Internet, offering, from a didactic point of view, technological support to teachers and students to optimize different phases of the teaching and learning process.http://www.utamed.cl and contains the indicated characteristics.

Given the importance that social relationships (student-student, student-teacher) have in EVEA, it is essential that the person who is interacting with someone through an EVEA perceives the presence of the other individual, even if they are not physically next to them. (Gunawardena & McIsaac, 2004; Kehrwald, 2008; So & Brush, 2008). In this sense, Gómez (2008) states that students learn

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more if they do not feel isolated in these environments, hence when these means of social interaction are generated that enhance a feeling of social presence, learning is favored. According to Garrison and Anderson (2005), social presence is a fundamental element that intervenes in virtual learning since its absence hinders the ability to express disagreements, share views or accept help. Other studies also reveal the positive relationship between social presence and the learning experienced by students (Caspi & Blau, 2008). Not only social presence but also the frequency of use of this type of environment can favor the learning experience. Those students who use or have used EVEA frequently perceive greater learning than those who use it sporadically or infrequently (Gibbs, 1999; Steiner & Voruganti, 2004).

From what has already been explained, it cannot be deduced that the interactivity of the environment by itself guarantees successful learning situations, but rather that this success depends on the correct use of said technology and a psycho-pedagogical design that adequately guides social interactions (Pérez, 2002).

**Social presence and its conceptualization**

An important finding was the concept of *social presence*. When someone goes online to interact with others, one of their main concerns is trying to get the other person to get an idea of who they really are.

The term *social presence* was introduced in 1976 by Short, Williams & Christie in the field of social psychology. These authors defined the term as the degree of *salience* (Stryker, 1987) of the person with whom one is interacting and the subsequent *salience* of the interpersonal interaction. Since then, research in this area has been increasing, however there is still no sufficiently consistent and comprehensive conceptualization of *social presence , since existing definitions*

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*contemplate only partial aspects (Biocca, Harms & Burgoon, 2003).* In fact, these authors identify three ways of understanding *social presence.*A first group of work emphasizes the idea of co-presence, that is, the degree to which the person believes that they are not alone, that they are aware of the other person and vice versa. A second group of studies suggests the importance of psychological involvement with the other and vice versa, that is, the degree to which those who interact pay attention to and understand each other, in terms of motivations, affective states, etc. The definition of Short et al. (1976), already cited, would be underlining this idea. A final group of work emphasizes behavioral interaction, that is, the degree to which the individual believes that his or her actions are interdependent or responsive to the other person and vice versa. For his part, Lee (2004) defines *social presence*as "a psychological state in which virtual actors (para-authentic or artificial) are experienced as real social actors, whether in sensory or non-sensory form."

From this dispersion, Biocca and his colleagues direct their efforts to formulate a more comprehensive conceptualization of *social presence* . This leads them to propose the *theory of networked minds* (Networked Minds Theory), which establishes that people feel interconnected through network communication interfaces (Biocca et al., 2003; Biocca, Harms & Gregg, 2001; Harms & Biocca, 2004).

From this theory, *social presence is understood as the degree of awareness, localized attention, affective and content understanding, and affective and behavioral interdependence with the other person.* It is a construct composed of six dimensions: (a) *Co-presence* , which refers to the degree to which the person feels that they are not alone and isolated in the virtual environment; (b) *Attentional dedication,* interpreted as the amount of attention

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that interactants devote to each other; (c) *Perceived understanding of the message*, which refers to the ability to understand the message received from the interlocutor and her perception of the degree to which the other person understands the received message; (d) *Perceived affective understanding*,understood as the ability to understand the emotional state and attitudes of the interlocutor, as well as their perception of the other's ability to understand the emotional state and attitudes of the subject; (e) *Perceived affective interdependence*, the degree to which the emotional and attitudinal state of the interlocutors mutually affect each other; and finally, (f) *Perceived behavioral interdependence*, which refers to the degree to which the behavior of the interlocutors affects each other (Harms & Biocca, 2004).

As a form of measurement, they developed a first scale of 88 items. A group of researchers reviewed the items and eliminated 19 that were redundant or confusing. The new scale was evaluated in a previous pilot study (Biocca et al., 2001), where it was reduced to 50 items. In a subsequent study (Harms & Biocca, 2004), this scale, called Networked Minds Social Presence Measure, adopted the definitive factor structure (36 items) proposed, with six dimensions and which includes with good internal consistency and criterion validity. Subsequent research is based on or uses this measurement scale in their studies (eg Fuchs, 2009; Shen, Yu & Khalifa, 2007; Stapel, de Kort & IJsselsteijn, 2008).

In this research, a factor structure of 5 factors and 23 items is adopted that explains a greater proportion of the variance. Considering that there are few questionnaires published in Spanish that evaluate social presence in EVEA, the present study proposes: (1) analyze the structural validity of the Networked Minds measure of social presence (Harms & Biocca, 2004), as well as the

reliability of the resulting constructs in the measurement of social presence and its relationship with perceived learning in virtual teaching-learning environments (EVEA); (2) obtain an abbreviated version that allows reducing the application times of the instrument; and (3) measure the social presence of the students in the sample in the use of the EVEA UTA $^{med}$ .

## Method

### *Participants*

94 students from the University of Tarapacá, Chile, who used the EVEA UTAmed, participated in the study. Their ages ranged between 18 and 36 years, with a mean age of 22.44 years (SD = 3.41). Of these, 58 men (61.7%) and 36 women (38.3%). Of the total students, 76 came from the Multimedia Design major, 6 from the Early Childhood Education and Psychopedagogy major, and 12 from the Basic Education and Psychopedagogy Pedagogy major. This is a non-probabilistic sampling given that the sample was obtained from the Virtual Education school, where the students voluntarily agreed to collaborate in this research.

### *Variables and Instruments*

*Social presence* in the EVEA UTAmed was evaluated using the scale for measuring the social presence of networked minds (Harms & Biocca, 2004), a version adapted to Spanish by Agut Nieto, Peris, Grandío and Lozano (2011). The initial instrument of 36 items and 6 factors was reduced to 23 items and 5 scales: co-presence (5 items), perceived understanding of the message (4 items), perceived affective understanding (5 items), perceived affective interdependence (5 items). and perceived behavioral interdependence (5 items) (see Table 1). Participants responded using a Likert scale ranging from 1 (totally disagree) to 7 (totally agree). The total social presence score was

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obtained by calculating the arithmetic mean of all items. To obtain the total scores for subscales, the arithmetic mean of the items belonging to each subscale was calculated. The Cronbach's alpha of the instrument was 0.94.

TABLA 1:
*Escala de presencia social en EVEA*

| |
|---|
| 1. La otra persona es consciente de mi presencia. |
| 2. La presencia de la otra persona es evidente para mí. |
| 3. Mi presencia es evidente para la otra persona. |
| 4. La otra persona capta mi atención. |
| 5. Yo capto la atención de la otra persona. |
| 6. Mis ideas resultan claras para la otra persona |
| 7. Las ideas de la otra persona resultan claras para mí |
| 8. Me resulta fácil comprender a la otra persona. |
| 9. A la otra persona le resulta fácil comprenderme. |
| 10. Podría explicar cómo se siente la otra persona. |
| 11. La otra persona podría explicar cómo me siento yo. |
| 12. Puedo describir con exactitud los sentimientos de la otra persona. |
| 13. La otra persona puede describir con exactitud mis sentimientos. |
| 14. A veces me influye el estado de ánimo de la otra persona. |
| 15. Los sentimientos de la otra persona afectan al tono emocional de nuestra interacción. |
| 16. Mis sentimientos condicionan el tono de nuestra interacción. |
| 17. Las actitudes de la otra persona influyen en cómo me siento. |
| 18. Mis actitudes influyen en cómo se siente la otra persona. |
| 19. El comportamiento de la otra persona es una respuesta directa a mi comportamiento. |
| 20. Correspondo a las acciones de la otra persona. |
| 21. La otra persona corresponde a mis acciones. |
| 22. El comportamiento de la otra persona está estrechamente unido a mi comportamiento. |
| 23. Mi comportamiento está estrechamente unido al comportamiento de la otra persona. |

Co-presencia. Ítems:1-5: Comprensión percibida del mensaje. Ítems 6–9: Comprensión afectiva percibida. Ítems 10-13: Interdependencia afectiva percibida. Ítems 14-18: Interdependencia conductual percibida. Items 19 -23:

Fuente: elaboración propia

*Perceived learning* was measured through 9 items (eg: "I have learned the same or even more than in traditional classes") (Richardson & Swan, 2003). This dimension in the original instrument was limited by having only two items and was enriched with seven additional items, yielding a Cronbach's alpha of 0.95, which significantly improved the reliability of the previous proposal, which had an alpha of 0.080. (see Table 2 )

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**TABLA 2:**
*Escala de aprendizaje percibido*

| |
|---|
| 1. Yo he aprendido lo mismo o incluso más que en las clases presenciales. |
| 2. La calidad del aprendizaje en estas clases fue excelente. |
| 3. Lo aprendido me permite un mejor desempeño. |
| 4. Realizo cosas que antes no sabía hacer. |
| 5. Con lo aprendido voy a sacar una buena calificación. |
| 6. He aprendido bastante con esta modalidad de trabajo. |
| 7. Lo que he aprendido me ha permitido afianzar mis conocimientos. |
| 8. Tener que resolver los problemas solo o en interacción con mis compañeros me permitió un mejor aprendizaje. |
| 9. Tener que adoptar un aprendizaje activo me permitió una mejor comprensión. |

Fuente: elaboración propia

The *degree of use of the EVEA UTA* $^{med}$ in the study was measured using a 4-point Likert scale: 1 (less than 1 hour per week), 2 (less than 2 hours per week and more than 1 hour), 3 (less than 3 hours a week and more than 2 hours) and 4 (more than 3 hours).

Information was also collected about the student's sex, age, and university degree.

***Procedure***

The participants had to participate in the curricular activities included in the different subjects of the study plan of the Multimedia Design, Early Childhood Education and Psychopedagogy and Pedagogy in Basic Education and Psychopedagogy career.

In the EVEA UTA $^{med,}$ students carried out individual and group tasks to develop specific and generic skills in the different subjects of the study plan. The student teams had to use the work tools that allow each group to share a virtual space, consisting of chat, forum, instant messaging and folders such as virtual portfolios, shared space in a learning community, digital walls, podcast, repository of educational resources , among others.

The structuring of the task by the teachers included monitoring, support and evaluation of the objectives of the different subjects that use the EVEA

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UTA [med] , and they were evaluated through the use of analytical and holistic rubrics. The activity was carried out during the second academic semester of 2012. Prior to the administration of the scales, the researchers explained the objective of the study and gave the pertinent instructions to guarantee the proper application of the instruments. To answer the social presence scale, students had to think about the member of the group with whom they had interacted most through the EVEA and about the sensations they experienced while interacting with that person through the environment.

***Analysis of data***

The empirical structure underlying the *Scale for measuring the social presence of networked minds was studied.*(Networked Minds Social Presence Measure) through an exploratory factor analysis (principal components with varimax rotation) and through the SPSS 20.0 statistical program. The internal consistency (Cronbach's alpha) of the questionnaire and each subscale was measured. From these results, a reduced version of the instrument was obtained whose factorial structure was ratified through a confirmatory factor analysis through the AMOS 20.0 program, using the maximum likelihood procedure for estimating the parameters (since the group size was adequate and the distribution of the data complied with statistical normality). A hierarchical regression analysis was carried out where the main variable was social presence and the dependent variable was perceived learning. The variables of sex, age,[med] to control its possible influence on the results.

**Results**

The descriptive statistics and internal consistency of the main variables are shown in Table 3 . The average scores referring to perceived learning and social presence are between moderate and high. The highest average score corresponds

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to the perceived understanding of the message and the lowest to the perceived behavioral interdependence. In general, students make moderate to low use of the UTA $^{med}$ virtual environment .

TABLA 3.
*Estadísticos descriptivos y consistencia interna de las principales variables en estudio (N = 94)*

| Factores | Media | DT | α |
|---|---|---|---|
| 1. Dimensiones de presencia social | | | |
| Co-presencia | 4.66 | 2.01 | 0.96 |
| Comprensión percibida del mensaje | 4.98 | 1.32 | 0.93 |
| Comprensiva afectiva percibida | 3.99 | 1.42 | 0.80 |
| Interdependencia afectiva percibida | 4.00 | 1.59 | 0.90 |
| Interdependencia conductual percibida | 3.82 | 1.50 | 0.90 |
| 2.Utilización del EVEA | 2.45 | 1.05 | - |
| 3.Aprendizaje percibido | 4.87 | 1.64 | 0.95 |

Fuente: elaboración propia

### *Exploratory Factor Analysis*

First, it was verified whether it is pertinent to perform an exploratory factor analysis. For this, the Bartlett sphericity test and the Kaiser-Meyer-Olkin KMO index were calculated. Both Bartlett's test of sphericity ($x^2$ (325, N = 94) = 2631.10 $p < 0.000$), and the KMO (0.745) have shown good values. After this preliminary factor analysis, 13 items were eliminated with a now simplified version of 23 items with five factors, which improves the reliability of the scale from 0.80 to a Cronbach's alpha of 0.94 and an explained variance that improves significantly from 63.17 to 81.25. The factor structure of this new scale is presented in the following matrix of rotated components ( Table 4 ).

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TABLA 4 :
*Matriz de componentes rotados*[a]

| Items | Co-presencia | Interdependencia conductual percibida | Comprensión percibida del mensaje | interdependencia afectiva percibida | comprensión afectiva percibida |
|---|---|---|---|---|---|
| ps2 | 0.877 | | | | |
| ps3 | 0.918 | | | | |
| ps4 | 0.915 | | | | |
| ps5 | 0.906 | | | | |
| ps6 | 0.880 | | | | |
| ps13 | | | 0.811 | | |
| ps14 | | | 0.771 | | |
| ps15 | | | 0.870 | | |
| ps16 | | | 0.853 | | |
| ps19 | | | | | 0.794 |
| ps20 | | | | | 0.766 |
| ps23 | | | | | 0.815 |
| ps24 | | | | | 0.693 |
| ps25 | | | | 0.717 | |
| ps27 | | | | 0.687 | |
| ps28 | | | | 0.717 | |
| ps29 | | | | 0.731 | |
| ps30 | | | | 0.579 | |
| ps32 | | 0.665 | | | |
| ps33 | | 0.725 | | | |
| ps34 | | 0.775 | | | |
| ps35 | | 0.885 | | | |
| ps36 | | 0.896 | | | |
| % varianza explicada | 21.69 | 17.74 | 16.33 | 13.64 | 11.82 |
| Fiabilidad | 0.96 | 0.90 | 0.93 | 0.90 | 0.80 |

Método de extracción: Análisis de componentes principales; Método de rotación: Normalización Varimax con Kaiser.

La rotación ha convergido en 7 iteraciones. b. Total varianza explicada = 81.25%

Fuente: elaboración propia

### *Confirmatory factor analysis*

The obtained five-factor model was subjected to a confirmatory factor analysis on the scores of the sample participants (Fig. 1).

In order to analyze the fit of the model, different goodness indices have been considered, in addition to the Chi square statistic: the incremental index (CFI; Bentler & Bonnet, 1980) and the absolute index (GFI; Jõreskog & Sõrbom, 1984). Values equal to 0.9 or higher in CFI and GFI indicate adequate model

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fit. The goodness of fit indices obtained are (x2 (325, N=94)=2631.10 p<0.000; CFI = 0.95, NFI = 0.91 and TLI = 0.85, CMIN/DF = 2.04, (values less than three are considered acceptable, Byrne, 2009) all of which are considered satisfactory for the five-factor structure of the scale.

***Relationship between social presence and perceived learning***

The results of the regression analysis (see Table 5 ) show the existence of significant effects of social presence and age that predict the learning perceived by the students, but not the degree of use of the EVEA UTA [med] of the study and the sex of the subjects in the sample that were not significant.

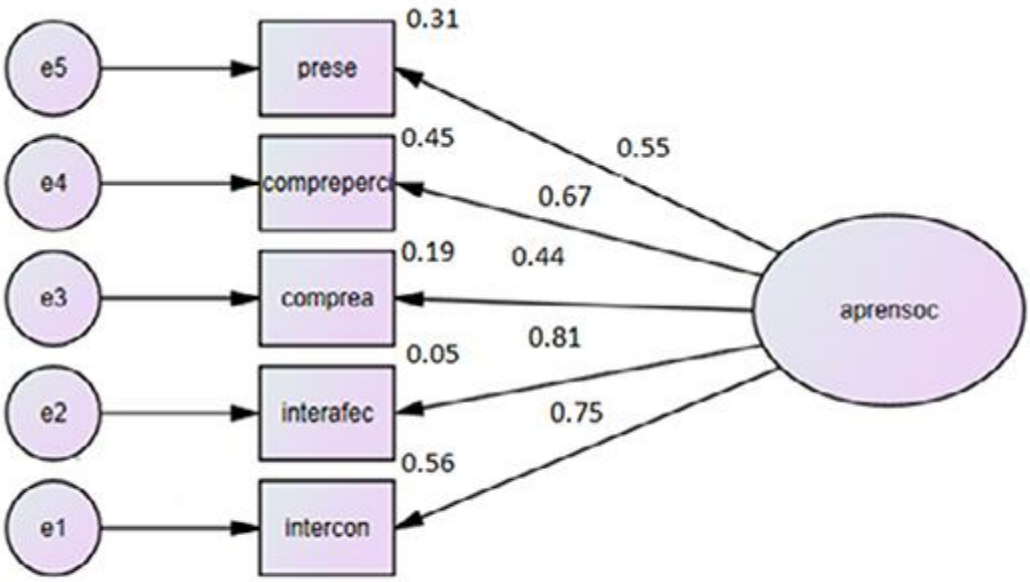


*Fig. 1 Modelo de AFC de cinco factores y presencia social (aprensoc)*

Fuente: elaboración propia

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TABLA 5:
*Análisis de regresión para la variable dependiente aprendizaje percibido*

| Modelo B | | Coeficientes no estandarizados | | Coeficientes tipificados | t | Sig. |
|---|---|---|---|---|---|---|
| | | Error típ. | Beta | | | |
| 1 | (Constante) | 0.964 | 7.147 | | 0.135 | 0.893 |
| | aprensoc | 0.268 | 0.039 | 0.609 | 6.835 | 0.000 |
| | Edad | 0.581 | 0.295 | 0.175 | 1.967 | 0.053 |

a. Variable dependiente: aprenper

Fuente: elaboración propia

## Discussion and Conclusions

In this study, the psychometric properties of a reduced version in Spanish of the scale for measuring the social presence of networked minds (Harms & Biocca, 2004) were examined, as well as the measurement of the social presence of students in the use of the EVEA UTA $^{med}$ and its relationship with perceived learning

The results generally show that students have the feeling of being interconnected with their partner while they are working on the EVEA, since the average scores in the different factors are between moderate and high. The highest average score corresponds to perceived understanding of the message and the lowest to perceived affective interdependence. A possible explanation for this result is that students who use this type of communication, by not being able to capture facial expression, posture, intonation and other non-verbal signals, become psychologically involved with their interlocutor, a necessary aspect to achieve motivation and the trust that allows beginning the exchange of information aimed at achieving learning. Consequently, in virtual learning contexts,

On the other hand, the results support the five-factor structure of the social presence construct (such as co-presence, perceived message understanding, perceived affective understanding, perceived affective interdependence, and

perceived behavioral interdependence) of Harms and Biocca (2004). This model has been corroborated through a confirmatory analysis. In the adaptation process, 13 items were eliminated, leaving the scale reduced to 23 items with greater explained variance than previous versions (see Table 1 ).

In this new version, the co-presence factor is composed of 5 items, the perceived message understanding factor of 4 items, the perceived affective understanding factor of 4 items, the perceived affective interdependence factor of 5 items and the perceived behavioral interdependence of 5 items. . The fact that people find it easier to report what happens to ourselves than to infer about what happens to others could help explain why the items related to one's own vision of the experience of life have been fundamentally maintained. social presence.

The ability of social presence to predict perceived learning is also confirmed, as suggested by previous studies (Caspi & Blau, 2008; Garrison & Anderson, 2005; Gómez, 2008; Richardson & Swan, 2003; Rourke et al., 2001). Thus we find that when students feel connected to their classmates, do not feel alone in the environment and have the possibility of expressing themselves, sharing opinions or asking for help from other people, they perceive that they learn more. Furthermore, the use of the EVEA in the study appears as a moderately significant antecedent of perceived learning (Steiner & Voruganti, 2004), which stimulates greater use of the EVEA in training settings.

In conclusion, the study provides a reduced version of the Networked Minds Social Presence Measure in Spanish based on the concept of social presence, which can predict learning in virtual environments. This version has satisfactory psychometric properties to be used in the EVEA and allows the application time of the instrument to be reduced. At the same time, the results obtained can guide

the design of learning platforms, having social presence as one of its central axes. Thus, to the extent that these environments facilitate interaction with other people (peers, teachers, etc.) in a simple, close and real way, they encourage participation and collaboration, and the teacher constitutes a mediator or catalyst for learning. the students, The generation of experiences of social presence and the construction of knowledge is being favored. Ignoring these issues would negatively affect the student's motivation and involvement in learning (García, Portillo, Romo & Benito, 2007; Prensky, 2001).

Based on the results, some considerations should be made. First, the relationships obtained through hierarchical regression cannot be interpreted causally because this study is cross-sectional. Another limitation was the use of a small sample, which nevertheless yielded satisfactory, significant and reliable results. On the other hand, we should continue delving into the nature and function of social presence in EVEA, given that it is a good predictor of learning in virtual contexts. The relationship between social presence and the development of relationships could also be explored through EVEA, or even understand social presence as a precursor to different types of learning. (Kehrwald, 2008). It would also be enriching to analyze other psychosocial processes (such as enjoyment, involvement,

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