

# Online Teaching and Learning Processes: Declarative and Procedural Knowledge

Eulalia Torras, Andreu Bellot

**Abstract**—To know whether students' achievements are the result of online interaction and not just a consequence of individual differences themselves, it seems essential to link the teaching presence and social presence to the types of knowledge built. The research aim is to analyze the social presence in relation to two types of knowledge, declarative and procedural. Qualitative methodology has been used. The analysis of the contents was based on an observation protocol that included community of enquiry indicators and procedural and declarative knowledge indicators. The research has been conducted in three phases that focused on an observational protocol and indicators, results and conclusions. Results show that the teaching-learning processes have been characterized by the patterns of presence and types of knowledge. Results also show the importance of social presence support provided by the teacher and the students, not only in regard to the nature of the instructional support but also concerning how it is presented to the student and the importance that is attributed to it in the teaching-learning process, that is, what it is that assistance is offered on. In this study, we find that the presence based on procedural guidelines and declarative reflection, the management of shared meaning on the basis of the skills and the evidence of these skills entail patterns of learning. Nevertheless, the importance that the teacher attributes to each support aspect has a bearing on the extent to which the students reflect more on the given task.

**Keywords**—Education, online, teaching and learning processes, knowledge.

## I. INTRODUCTION

COMMUNITY of inquiry model reflects the critical thinking based educational experience. The learning experience can be achieved if the teaching-learning phase emerges from cognitive, social and teaching presence [1], [2]. The community of inquiry model is structured around various phases. The first phase reflects the initiation phase from an event that triggers: a problem, dilemma or tension that comes from the experience is identified or recognized. Online education can deliberately or indirectly add a triggering event for the speech. The second phase of the process is exploration. In this phase, participants alternate the inner world, a reflection of the person and the social exploration of ideas. Students must perceive or understand the nature of the problem and then move on to a fuller exploration of relevant information. The third phase, the integration, is characterized by the construction of meaning of the ideas generated in the exploratory phase. During the transition from the exploratory phase, students will begin to assess the applicability of the

ideas and their connections, describe the problem or analyze the event in question. The fourth phase is a dilemma or problem resolution through direct or vicarious behavior. In an educational context management involves testing the use of various ways of thinking and consensus building within the learning community. This model reflects the critical thinking based educational experience. The learning experience can be achieved if from the teaching-learning emerge cognitive presence, social presence and teaching presence [3]. Social presence has been observed in online learning communities [4]. Social presence is defined as the ability of participants to project a community socially and emotionally as real people through communication. Social presence is the social-interaction, which takes the form of emotional expression, openness in communication and group cohesion. Recent research has shown that to achieve social presence it is not necessary to emulate the conditions of face to face interactions, for example by increasing interpersonal signals [5]. Rather, it affirms they the sense of belonging, or perceptive immersion in the group, can be done through the creation of a shared social identity among students [6]. From this point of view, the social presence is a function representing the group by its group members.

Cognitive presence has been defined as the extent to which students are able to construct and confirm meaning through sustained discourse in a critical community of inquiry, in other words, a community that works. Cognitive presence reflects the construction and application of higher-order knowledge. This presence implies, therefore, a process of reflection that is indivisible language [7]. Cognitive presence is defined by three types of utterances: content scanning, integration and resolution. These three types of utterances show the relationship between the internal world and the external world represented by a circuit of words. Initially, students explore the new content, then managed the difficulties of integration between new content and what they already know and finally, are able to solve these difficulties and therefore be able to act on the basis of new knowledge. The transition from one stage to another is marked by the passage from the inner to the outside and vice versa. Cognitive presence is more easily sustained when a significant degree of social presence has been established.

The third element of an online educational experience is established by the teaching presence. The teaching presence is the element that links the creation of a community of inquiry for educational purposes. Teaching presence is defined through these categories: instructional management, knowledge building instructions and directives. The teaching

E. Torras and A. Bellot are with the OBS Business School, Av. Gran Via de l'Hospitalet, 16-20, 08902, L'Hospitalet de Llobregat, Barcelona (phone: +34932851902, +34 934005273; e-mail: eulalia.torras@onlinebschool.com, abellot@planetadeagostini.es).

presence is related to the process design, facilitation, and guidance throughout the learning experience in order to realize the desired learning outcomes. The three categories that characterize the teaching presence are instructional design and management, understanding and direct instruction. Establishing teaching presence means creating a learning experience for students to progress through instructor facilitation, support and guidance. As teachers we must actively guide students through the planning of the lesson plans, materials, reinforce key concepts and encourage participation. These components of teaching presence are key to a learning experience on the part of students. Defining terms and starting discussions; sharing personal meaning; guiding the discussion; avoiding misconceptions; sharing expectations, fostering collaboration and confirming understanding of the concepts are but some examples. In a technology mediated learning community, the educational experience entails the intersection between cognitive presence, social presence and teaching presence. These three types of presence and their relationships must be analyzed in order to examine the process of teaching and learning [8], [9].

In addition to the community of inquiry model, the construction of knowledge has been analyzed from three different levels of articulation: complementary, procedural and declarative [10]. Procedural processing is an activation of a learned sequence of elements in long-term memory that is initiated by appropriate inputs and then proceeds without subject control, without stressing the capacity limitation of the system, and without necessarily demanding attention.

The first level of knowledge building consists of declarative knowledge. Declarative knowledge is referred to that which is verbalized and unfolds to hear or read statements implying understanding properly related, for example, the elements to diagnose a situation and weak and strong points of a given decision. At the second level, another kind of knowledge plays a key role in the development of the construction of knowledge: procedural knowledge. The term refers to the know of how. Procedural knowledge is applied directly to a task, for example, an educational intervention. It tends to be less general than declarative knowledge. At the third level, we would find a set of skills derived from the ability of people to contribute their knowledge to all kinds of information received in the context of their own existence, including goals, values, attitudes and beliefs. It is the prospect of an autonomous decision.

Online discussions planned with the intention of helping a group of students who will be future language teachers have been identified as the bridge between declarative and procedural knowledge dimensions [11]. The declarative dimension identified in the online discussions refers to the participant knowledge about the content and explicit knowledge about how that content works. The scale of proceeding without separating from the reflection on the knowledge of the content area, also includes drawing the appropriate use of such knowledge in all practical aspects [12].

Declarative knowledge processing is a temporary activation of a sequence of elements that can be set up quickly and easily but requires attention, is capacity-limited and is controlled by the student. The purpose of this research is to show some evidence of the mutual influence between teaching presence, social presence, declarative knowledge and procedural knowledge in online learning programs. The learning products from fifty students that have completed an online higher education program in secondary education have been analyzed.

The aim is to analyze the social presence in relation to the two types of knowledge, declarative and procedural, in the online teaching-learning. This is embodied in the following objectives:

1. Analyze social presence contained in asynchronous communications developed during higher education mediated by information and communication technology.
2. Analyze the declarative knowledge contained in the products of learning, in both asynchronous communications and activities during the learning process of in higher education mediated by information and communication technology.
3. Analyze the procedural knowledge contained in the products of learning, in both asynchronous communication and activities during the learning process in higher education mediated by information and communication technology.

## II. METHODOLOGY

### A. Methods

Qualitative methodology [13]-[15] has been chosen. This methodological option was chosen because the research aim involved the process of teaching and learning. Experimental manipulation and strict control were not involved for several reasons: learning must be considered in context; the process involved a necessarily limited time period; it was important to obtain direct data from the interaction among participants; the process was long and complex enough for it to not be reduced to a set of variables and it was important to maintain the naturalistic character of the investigation and respect how the process occurred.

### B. Units of Analysis

The unit of analysis are the topics of discourse. Topics of discourse are defined as fragments of text similar in style, form and procedure. The identification of this level of analysis was conducted on the material in the teachers' and the students' discourse provided by various texts (scenarios, questionnaires, interventions in the classroom, messages to mailboxes and activities).

### C. Participants

Data consisted of 148 electronic communications written by and 95 questionnaires answered by 95 students enrolled in an online Master's degree in education. This data was collected to analyze the nature of knowledge being produced. Participants would have professional experience and extensive discourse of

educational contexts. In other words, students who participated in the investigation had prior experience and specific training in the professional context of educational science. The participants in courses 1 and 2 were mainly teachers (70%), the remaining participants carried out other educational tasks (e.g. school coordinators). All of them had a Bachelor's degree or Master's degree in education. We considered that all the participants had enough professional experience (all of them are currently working) and educational background.

#### D. Instruments

Due to the diversity of the research questions it was necessary to devise different instruments to respond to the research question. We designed two debates presenting a simulated problematic situation that could be managed if the students used both, declarative and procedural knowledge. We also designed a questionnaire that allowed us to record the knowledge level. Finally, we created a database to record all written online messages sent during the courses, including the following different aspects: who sent the messages, who received the messages, date of the messages, time of the messages, mailbox used by the message sender, full text and documents attached.

### III. RESULTS

The analysis of the fragments of discourse contained in the 95 questionnaires and the 148 written communications learning products has been made based on the categories protocol designed for the research, thus addressing the emotional expression categories, openness in communication, group cohesion, declarative knowledge and procedural knowledge. Developed content analysis has shown that in the verbal fragments appear to be based on the protocol of categories. Therefore, the first notable result is that the online discussion shows evidence analyzed both social presence, as declarative and procedural knowledge fit the context.

The social presence appears in 33.8% of the total fragments, declarative knowledge involves 27.7% of the total fragments, procedural knowledge is found in 22.9% of the fragments and the adjustment to be seen in context 15.6% of the fragments of asynchronous conversation by students. The three categories of social presence appear spread over student speech. While emotional expression comprises 35.9% of the fragments of social presence, opening in communication stands at 33.3%. Finally, the expression of group cohesion is 30.8% of the fragments of speech with social presence. The verbalized knowledge represents a 66.2% of the total fragments, declarative knowledge represents 41.8% of total fragments, procedural knowledge is found in 34.6% of the fragments and the adjustment to be seen in context 23.5% of the fragments of asynchronous conversation by students.

Social Presence						Level 1: Declarative		Level 2: Procedural		Level 3: Context	
Emotional expression		Communication Openness		Group Cohesion		N	%	N	%	N	%
28	12	26	11	24	10	64	27	53	23	36	16

Fig. 1 Values and percentages of the various categories

### IV. DISCUSSION AND CONCLUSIONS

The social presence has been identified in the online discussion being the vehicle to allow students to advance in the three levels of knowledge: declarative knowledge, procedural knowledge and the level of context. Emotional expression, open communication and cohesion of the group of participants has allowed meanings to be shared around the planned activity with educational purposes. The social presence based on open communication and acceptance of the views of other members of the classroom, has allowed a dynamic that facilitates the emergence of new concepts and contents. The social presence, planned and supervised by the teacher, has been shown as a very suitable inter-psychological tool for the acceptance of new concepts, reflection on how to put these concepts into practice and the use of these concepts in professional context.

In this regard, it is noteworthy that the utterances that show declarative knowledge tend to occur in greater numbers at the beginning of the process of teaching and learning held constant in the intermediate and final stages. Also, the utterances connected to procedural knowledge and context level are more frequent in the intermediate and final stages. Learning occurs when the student constructs new knowledge based on previous experience or prior knowledge by adequately articulating the three levels of knowledge. The new learning involves linking the new concepts with previous concepts including the size and context of use.

#### ACKNOWLEDGMENT

This paper has been written in the framework of the research supported financially by the OBServatory. International Observatory on Online Higher Education in Management by OBS Business School.

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**E. Torras** became Main Researcher at International Observatory on Online Higher Education in Management in 2015, Professor at Universidad Internacional de Valencia in 2013, Professor accredited by Ministerio de Educación, Cultura y Deporte de España in 2011 and Consultant Professor at Universitat Oberta de Catalunya in 2001. She was born in Barcelona in 1971. Her educational background

includes Phd in Information Society and Knowledge from Universitat Oberta de Catalunya in 2008, a Phd Psychiatry and Psychobiology Bio-Psycho-Social Dimensions from Universidad de Barcelona in 2003, a Postgraduate Degree in Training Educators from Universitat Oberta de Catalunya in 2000, a Postgraduate Degree in Statistical Software from Universitat Politècnica de Catalunya in 1995 and an undergraduate Degree in Psychology from Universidad de Barcelona in 1994.

She has worked as educational consultant in Barcelona between 2000-2011, as team leader at Fundació catalana de l'espai between 1996-1998, as team leader at Movistar between 1994-1996 and as social educator at Fundación salud y bienestar between 1992-1994. She has written several articles and books, from such as, C. Leon, E. Torras, Family networks and attitudes towards work-related problems, London: Thomson Reuters, 2015; E. Torras, "La ética del cuidado y el discurso colaborativo en línea," *Estudios sobre educación*, vol. 24, 149-171, 2013.; E. Torras and E. Barberà, Professional online learning processes. Nature and change in teaching and learning. Saarbrücken: Lambert Academic Publishing ag & co. kg. Germany, 2010.

Prof. Torras is reviewer at Computers in human behavior and has been editor at eLearn Center Research Paper Series.



**A. Bellot** became Higher Education Innovation and Methodology Director at Grupo Planeta in 2013, Academic Director at OBS Business School at 2008 and Academic Director at EAE from Grupo Planeta in 2007. He was born in Barcelona. Educational background is Degree in Pedagogy at Universitat de Barcelona in 1991.

He has worked as educator at Barcelona and as tutor by the Universitat Oberta de Catalunya. He has contributed and led a large number of innovation projects in higher education in Spain.

He has developed innovative projects at the Universidad de Barcelona, the Universidad Politècnica de Catalunya and the Universitat Oberta de Catalunya, Universidad Internacional de Valencia (VIU) and Centro Universitario Internacional de la Universidad de Barcelona (UNIBA) among others.