

Knowledge management with collaborative technologies of the prosumer teacher

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Abstract— Teacher immersed in the information society, has transformed their roles and competencies in the educational and research space as part of their work. The teacher evolves from the figure of e-learning, to the producer teacher, where research is mediated by the collaborative web (e-research). The present research aims to characterize the collaborative technologies and the principal functions of the prosumer teachers, used by teachers in higher education of the faculty of education at the University of Aveiro and University Military Nueva Granada . The methodology is qualitative with the use of focal groups, where the instrument of measurement is the interview that allows knowing points of view and arguments. The analysis carried out was one by analysis and emergent categories that allow contrasting: members of the research groups, the need to train teachers-prosumers and the impact that technologies could have on higher education.

Keywords— Prosumer, teacher, Research, Collaborative technologies, knowledge management

I. INTRODUCTION

THE social web has emerged as a concept to describe and group the interactions developed in the field of virtuality and within the framework of the information society, whose reference focuses on collaborative dynamics, communicative mediation and the wide variety of services offered by the internet, in terms of the reduction of spatio-temporal gaps. In that order of ideas, authors have been positioned the birth of the social web in the years 2004-2005 [1], [2], in which, the term is coined by Tim O'Reilly to denote the difference with respect to the static that was observed in the network, where the contents were displayed in a flat manner and without any intervention on the part of the users.

The conceptual dimension of the proposed social web opens up the possibility of seeking and assigning a pedagogical meaning to the use of the benefits of the network and the advantages of interactive communication and information, which is easily accessible and open to diverse social demands. However, education as a continuous and integral process must be oriented within the framework of pedagogical knowledge, so that the contents and resources found in the network, may account for constructive learning, provided that it is guided and literate.

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In fact, the need to specifically incorporate ICT in higher education is considered, taking into account the demands of teaching-learning systems that are more flexible and accessible for subjects, taking into account that the virtual world and the social web, facilitate the educational process in terms of costs, times, distances and, in some cases, efforts [3].

Therefore, the work of the teacher and the educational community in general implies acquiring a conscious and reflective skill in the use of said social web.

The potential of the use of "technology in the teaching and learning processes in the university, as well as in the administrative and service processes of the educational community, has been pointed out, is very high and contributes to the global value of the institution of a clearly highlighted form " (p.2) [4]. Another aspect to take into account on the articulation of the social web in the educational context, is the formal need (policies, norms and institutional actions) and informal (self-management, autonomous and daily) of media literacy for the development of skills in the use and appropriation of technological resources based on personal, professional and ethical development. One of the proposals on this topic [5] revolves around a series of competences in the instrumental, cognitive, ethical and aesthetic order coherent with the development of critical reflections on the proper use of social networks, web applications and the tools there arranged; proposing a model of convergent training for both students and teachers and actors in the academic community, aimed at encouraging contextualized learning and the implementation of technologies, such as ICTs, in favor of academic and axiological growth.

Cyberspace requires users with heteronomous and autonomous profiles, which is why digital (or media) literacy is seen as prevailing in the policies and needs of contemporary societies. This represents a challenge whose progressive fulfillment would achieve citizens with habits and ideal behaviors in the face of the abysmal impact of the social web. The cultural and historical resonance provided by the impact of this social web, has managed to change not only the protocols, means and symbols, but also, has generated a transformation in the roles and profiles of the people who access these technological mediations: although no longer passively, users and especially students, become collaborators in the creation of content, contributing from their experience in debates and reaffirming the context that represents a different vision of learning focused on interests and rhythms favored by various resources provided by the web. In the words of some authors [6] "the cybernaut acceded to the condition of prosumer" (p.29), which is an acronym that fuses the conditions of consumer and producer in the same figure or subject.

A. An examination of the referent of prosumer: producer and consumer

The term is used to refer to a user who transforms from consumer to producer, which throughout the text is called prosumer (producer and consumer). According to the definition presented, the prosumer exercises both roles together, without separating these roles, constructing a bridge, which, according to Soep [7], should be a part of the consciousness of the work of the user in anticipating complexity and offering help to other users. This is especially true because the prosumer will evoke the principle of user action – placing oneself in one's role – when incentivizing the consumer to become in some way a producer of communicative experience. Thus, they will have a voice and a vote in how the prosumer is configured, and simultaneously, this will impact the activities that the user will perform.

Alvin Toffler inserted the concept of the prosumer explicitly to leave behind the standardization of products or services that were being managed through the cycles of mass production in the industrial era [8].

The context of Toffler's vision was the impact of technologies on society, enabling the relationship of the coexistence of modernity and postmodernity that makes a distinction between producers and consumers. This idea also places the figure of the prosumer as one of power in postmodernity, which emerges in design, creativity, and innovation as they are lived today, amounting to a value added to the specialization of the content, information, services, and products that go hand in hand with an invisible economy of the masses.

The prosumer is a figure subsequent to the emergence of the social web, [8] thus, it could not have developed this role in the industrial era or in another moment other than our current information society. Expressions, forms of packaging information, and collaborative chains are some of the peculiarities generated in the context of prosumers, which has penetrated even the services of the social web themselves, gradually reaffirming their conviction to provide for the needs of other users. Similarly, prosumer activity is characterized by exponential growth, specifically in the impact of web-based designs and collaborations that have culminated in the quality of contents or services presented by a range of entities that offer services in the network of networks.

In the 21st century, the prosumer becomes a polysemic concept that alludes to hybrid elements in different social, economic, and cultural fields. Similarly, the term begins to take off with web users who create content in a self-sufficient manner, without intermediaries but with a range of tools that are capable of resolving their own needs. Thus, the term first had greater impact in the area of economics to define the producer of elements and values; however, with the technological revolution, it has spread to various fields, going from being an obsolete concept to taking its prospective nature in the dynamics of the cybernaut. In this context, the prosumer permeates the transformed educational field to reach the teacher and teacher training.

B. E- research

The social web has provided a large number of media and applications that have multiplied the possibilities to interact

with others or to manipulate information; This is how, in the scientific field, researchers can be helped in tasks such as project management, workflow control, information tracking, data analysis, information representation and publication of results. Some have called this form of networking, in the scientific field, as social science (or 2.0) in analogy with the so-called social web [9].

Education is not alien to the social and technological phenomenon of the internet, and responding to the needs of a dynamic and innovative society, the education that employs this technological means to boost learning, expand coverage, keep up to date, promote continuous training, Break down temporal and spatial barriers. Research on this new social space is called virtual ethnography, which seeks to understand the world of meanings, identities and dynamics of the process of educational interaction in virtual environments [10]. It is stated that virtual ethnography is not enough to study all the phenomena related to virtual education, other techniques are also necessary, such as the focus group, the panel of experts, in-depth interviews, studies through a survey, semi-structured interviews, meta-analysis or impact evaluation [10].

Internet has also narrowed the boundaries between the public and the private, a frontier that must be taken into account by the researcher, and whose distinction constitutes a vertebrating category of the ethical decisions that a researcher must make in and from the use of the internet. [11]. In this way, we also begin to perceive an important need to address the ethical issue in e-research.

ICT have played a fundamental role in the phenomenon of globalization of society, which has led organizations to seek international alliances to achieve impact in other countries or survive competitively in their own. The universities are no strangers to this, and the scientific communities much less. Technology evolves at a very rapid pace and it is necessary to recognize that different areas of education face new challenges in terms of teaching and learning that must adapt to this technological vanguard to satisfy needs and respond to modern educational complexity [12]. It is crucial, too, that the education systems of countries such as Colombia, abandon the pretense of facing alone the educational challenges of a globalized world; it is necessary to be able to participate in collective projects; otherwise, it will be left aside from many advances in research and education, and the high costs of such delay in the development of societies must be borne [13]. The research teacher, then, should be ready to broaden his field of action, participate in projects of an international nature, with multidisciplinary academic communities, and to achieve one of the current requirements is the management of ICT, since as noted by authors [14], changes in the role of the teacher must be assumed responsibly and facilitated as a counselor who, having knowledge of information and communication technologies, acts first as an individual collaborator in the student's learning, and later as an expert whose judgment, without Doubt, it is valuable for this learning process.

C. Collaborative technologies

Dillenbourg [15] indicates that the adjective collaborative refers to four aspects of learning: the situation or that which calls for and allows collaboration between people of the same status; the interactions that should facilitate collaboration, such as technological tools; the learning mechanisms themselves (assimilation and accommodation), and the effects of this collaborative learning reflected in different record dynamics.

Collaborative tools or technologies oriented towards information and communication technologies (ICTs) are varied and their choice and use will depend on several factors such as the type of activity, availability, results and expected impact on learning, evaluation methods, among others [16]. In this sense, technologies such as emails, videoconferences, digital markers and search engines, software for conceptual analysis, diagrams and projects, virtual simulations, blogs, micro blogs, voice forums, wikis and social networks, e-portfolios, are available. to name several.

Other authors, such as Batarelo, Nevinand and Malian [17], state that advances in ICTs are important since they can generate a proactive change in prior knowledge, since students, through the experience of technology, develop and implement underway collaborative learning. In agreement other authors state that collaboration in the educational context is conceived as an inherent and distinctive characteristic for learning in virtual environments, supported by technologies, but that it is not the only one, since not only are these technological tools needed for a collaborative dynamic is generated, but it is also necessary to set in motion a whole series of pedagogical and social aspects, among which planning and monitoring are essential to guarantee student learning [18].

It has been shown [19] that the use of ICT in collaborative environments facilitates the construction of knowledge and the resolution of complex problems, and that although such investigations are often complex and time-consuming, it is important to analyze the appropriation that teachers have about these technologies as tools that empower each student in the higher education process.

D. Knowledge management

According to researchers, [20] knowledge management is a capacity that man has to, through different processes, create new knowledge, disseminate it and incorporate it into new products, services and systems. The foregoing indicates that the management of knowledge in higher education, and hand in hand with ICTs, involves a complex series of activities such as the creation and capture of information, its structuring, transformation and transfer, and storage and incorporation into other processes.

According to other authors, knowledge management must be adapted to the availability of ICT as a tool that makes education more flexible in an innovative, effective and purposeful manner [21]. In this sense, different uses are proposed that can be given to ICTs depending on the form or

management of knowledge management at its different levels: in terms of knowledge creation, technologies offer virtual laboratories, research resources shared and shared creation of resources; for the transmission of knowledge, we talk about virtual campuses and e-learning; for its coding, it is possible to resort to virtual libraries or networks of knowledge libraries; in terms of dissemination, there is the possibility of using journals and electronic publications, as well as e-books; and finally, for the application of knowledge, ICTs offer learning networks, network knowledge transfer and innovation as an executing vehicle.

This same author, indicates that the first process, generation or creation of knowledge, is the responsibility of scientific research as a function of university institutions or higher education, where the digital world offers important advantages (speed, adaptability, expression free, immediate searches, among others) that should be used to make education more flexible and enrich it technologically [22].

II. METHODOLOGY

Taking into account the complexity of the analysis of the educational phenomenon and the impact of the social web and research in higher education, this proposal will adopt a qualitative approach [23], based on the ethnography of the virtual [24] to establish social trends and data from the documentary interpretation, as well as the analysis of categories that allow to know in depth the object of study. This qualitative methodology will be carried out with focus groups, with the interview as an instrument of data collection knowing the point of view and the argument under study. With a dimension of open questions, an analysis of emerging categories is carried out that allow contrasting: the members of the research groups, the need to train teachers-producers and the impact that could have on higher education.

In this type of methodology, several sources or primary documents are considered according to the object of study. At the level of data processing emerging from the general and substantive theory [23], a constant comparison will be used, which confers greater reliability and relevance of the results, making possible a foundation of the data analysis carried out with the Atlas ti software.

From the qualitative proceeding, the hermeneutic method is used in the interpretation of the consulted literatures and the analysis of collected data, that is, the search for meaning and meaning to the units encoded in the primary texts and experiences, thus establishing emergent categories that they allow to complement the categories of analysis arranged to understand the inductive referents of the selected documents, which facilitates the in-depth approach of the object of study. Likewise, the method allows to analyze and interpret in the light of the reference frames derived from the primary documents, how to validate, apply and relate the information collected through various techniques used for that purpose.

Codification process

Prior to coding or classifying the information, three categories (Web 2.0 in higher education, the teacher-prosumer in the educational field, and ITCs and tools used in Web 2.0) and

nine subcategories were created to serve as a reference point. These categories were constructed from the discussion and conceptualization of theories of academic authorities on Web 2.0 and prosumers (Alvin Toffler and Marshall McLuhan), in addition to studies on the topic by the team of researchers. The figure below presents the initial categories with their respective sub-categories.

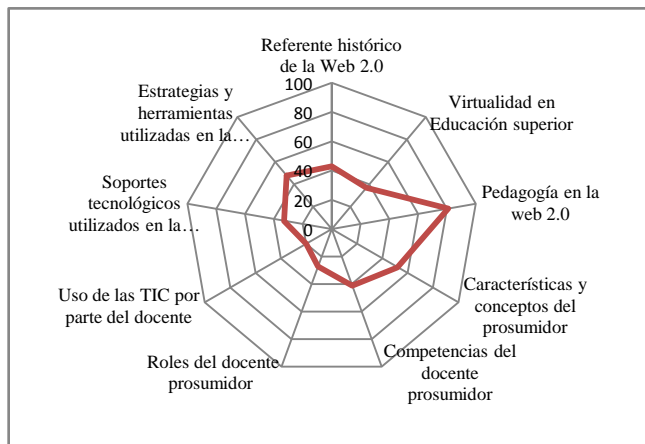


Fig. 1. Basing codes on the sub-categories.

III. RESULTS

The sample consists of 270 teachers: 230 from Qatar, 20 from Angola, and 20 from Brazil. Mostly, with ages between 35 to 60 years; 83% of them with a master's degree pursuing a doctorate and the rest graduates, who provide education, didactic education and multimedia education. 55% of teachers are from the education area, their research projects are starting, and they have access to computers or laptop.

According to the analysis of the emergent categories about the e-research, after the transcription of the 270 surveys of the focal group and passed by atlas, categories emerge as they are; Research processes, research in higher education and object of study. From them we show the first category research process with network, group and individual work, which denotes the work in a network with a prevalence in the frequency of 15.

From this we can say which professors emphasize the work in network, thus strengthening the bonds of investigation. The second emergent category is the research in higher education in this category, the development of competencies is observed where the researchers carry out research searches in front of those competences that have giving strength to their professionalism with a high frequency index 24 within the descriptors, contribution social, search for financial returns, improvement of social status, and scientific recognition. The third category is the object of research that demonstrates the search of the object of study in accordance with social interests, leaving aside the group and personal interests with a minimum scientific search with technological tools.

The proposed research leads us to consider, initially, two aspects, the first being the relationship between teacher and research, and the second is research and ICT.

Regarding the first point, about the teacher and its relationship with research, Vidal and Quintanilla [24] consider that the relationship between teachings in research is inevitable, and in fact, it is favorable since a positive relationship has been found between the time devoted to research and scientific production in higher education [25]. In this sense, it was evidenced in the present study, that higher education scholars attach importance to research, which agrees with that found by researchers [26]; however, it was found that a large number of teachers do not practice it and their products or systematic studies are few. This coincides with other research in the same context of higher education [27]

Given this panorama, it is worth highlighting the positive aspects that emerge from the research-teaching relationship, where, these authors propose the following assumptions: research activity improves teaching; academics can not be good without doing research; some of the infrastructures achieved through research are also used in teaching activities; the research activities contribute to updating the curriculum; and the courses assigned to the teacher are favored if they are related to their topic of interest in the research.

On the other hand, in higher education, the same universities invite the teacher to participate in research work [28], but it is important that this call is made to them, be supported by training processes that facilitate and strengthen the research and teaching action, since, as pointed out by Vidal and Quintanilla [20], good research groups can provide new technologies (infrastructure) and knowledge for training.

But the teacher-researcher in training is not only faced with a complex scenario of paradigms, methods and research instruments but before a reality that is transformed, which poses new challenges, and one of them is related precisely to ICTs, the way in which that have been integrated and have caused social, economic, political, and cultural changes and, of course, how they affect the educational field, where we must bear in mind that "the agent of change is not technology in itself, but the uses and construction of meaning around it" (p.13) [19].

Regarding the second point, ICTs within the processes of research in education, must be analyzed in all stages of this process, from the consideration of the object of study, to the strategies and instruments to select information, analyze and disseminate it.

It is precisely those uses and constructions around the technology from which these new spaces arise research objects, spaces of human tissue and spaces in the so-called virtual world, with cultural practices [29] and at the same time spaces where the researcher can support their work, with fields of action, languages and characteristic practices, to which the mentioned author has denominated cultural surroundings for the scientific communication.

These human constructions around technology, cannot remain in assumptions, but deserve to be studied, and this is where virtual ethnography or ethnography on the Internet can serve to achieve an enriched meaning of the meanings that technology is acquiring in the cultures that they lodge it or they are satisfied thanks to it [19].

Another aspect to take into account in the research processes is related to the sources of information: before a problem was to have a limited number of such sources or

difficult access to them, while now, before the information explosion, and with the diversity and multiplicity of sources found on the web, the problem lies in knowing how to select reliable information (media literacy). The task of evaluating a source of information entails the valuation of a series of elements intrinsic to it, which, in the case of digital sources, focus on the formal aspects and the quality of the content of the resource [30].

On research methods and strategies, it is clear that e-research "does not exclude or render obsolete the previous research methods and techniques ... e-research also tests the researcher's technical abilities" (p.5) [27]. Electronic research supports research processes, focused on study spaces that may or may not be within the network (skills of the prosumer).

Now, regarding the collection of information in electronic research, it is illustrated that it can have the following manifestations: work groups or research networks through the web, using forums or videoconference, design and preparation of questionnaires, distribution and collection of surveys in text format, structuring of interviews in text format using email and / or its realization by conference or telephony via web [31].

The analysis of information, says the author, can occur from: the analysis of transcriptions of texts, appointments using specialized programs, statistical analysis to quantitative studies through computer programs, online counseling. However, it is concluded that e-mail is related as the service most used by researchers to communicate among them, and a low percentage perform an exchange of experiences in real time through the network.

In the publication of research results, ICTs also play an important role, from blogs, wikis, and research forums to specialized magazines, online books, and digital libraries. According to researchers, blogs often discuss and exchange ideas about new research or emerging trends in different fields [32]. This same author identifies 2.0 journals as those tools for editing and managing content of the social web, where interaction between the actors linked to it is encouraged, and editorial processes related to the dissemination of science are improved.

Reference managers and social labeling sites are focused on streamlining and enriching the writing process of scientific articles, online software for the management of bibliographic references and bookmarking [32]. Social networks are also configured as sites to share knowledge, manage readings, find researchers with similar interests, call events, etc.

Another results should be divided into three large focus areas: i) the evaluation of prosumer roles, ii) the classification of teaching functions in contexts mediated by the social web from the compendium of studies analyzed, and iii) the characterization of new teaching competencies, obtained from a prospective outlook at scenarios of change in the information society. Regarding this last area, a parallel is drawn between current teaching competencies in b-learning contexts and new contexts based on prosumer action.

The results show that the new roles performed in media environments for the social web are as follows: 1) design, 2) communication, 3) research, and 4) evaluation. These offer a complex task to the teacher interested in reforming the forms of interacting and knowing together in which the educand is a

subject with experiences, knowledge, and contributions, eager to be understood in the framework of a collaboration in which both the teacher and the student learn in synergy. For this reason, the discussion of these results revolves around the obstacles that the teacher may face in taking on this dynamic role because it addresses a transition not only in scenarios, strategies, or resources but also in terms of attitudes, methods of researching, and ways of comprehending the ability to form one's own autonomy and that of the student as a basis for educational transformation.

Given the expectations presented by the entry of the prosumer, a synergy is proposed between the roles found and validated by teachers and coordinators in the field work and those regarding the perspectives of the prosumer. In summary, the mixture and coupling of the roles played in current practice with the roles that will be faced as challenges in the near "future" unveil an innovative and proactive vision of what it means to be a teacher in the digital era [6].

Of role transformation, the functions of the teacher-prosumer emerge and are classified as follows: communication, interaction, empowerment, and educational action.

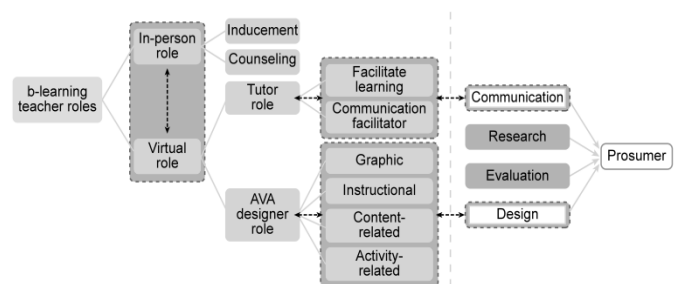


Fig. 2: Re-definition of the roles for b-learning contexts from the prospective outlook of the teacher (prosumer) and mediated by the social web

The prosumer communicates, necessarily in dialogic form, based on his or her profile as producer-communicator and user-analyst, and therefore, the communication is not unidirectional. Furthermore, it calls upon not only the linguistic channel but also the capacity for visual and symbolic communication. In this manner, prosumer communication goes beyond dialogues and conversations with others, transcending to an intersubjective relationship found in communication theories anchored and/or objectified in social groups. [33]. stress the need for literacy in various codes and communicative elements transformed by the impact of technology in light of media competency to search, select, and interpret the information to be discussed and refuted in a framework of prior knowledge and experiences. The system of communication can no longer be based on that of sender, message, and recipient (Aparici, 2011) [34]. because, in addition to these, the component of feedback as a regulatory factor changes; thus, the informational tends towards the formative as a result of patterns of participatory dynamics. This is when a dialogic and conversational model is conceived and gains strength in the educational field through Cloutier's term for the sender and recipient, denoting the condition of a teacher and educand with the ability to self-regulate, manage,

and alternate messages and information through the duality of sending and receiving messages, without failing to contextualize this information.

In light of this increase in prosumer practices, the prosumer interacts, revealing the importance of interactivity, whose importance has grown over the course of the 1980s due to the joint efforts of users and producers. Meanwhile, technologies and their resources have made it possible to mediate, communicate, and collaborate among chains and structures of social groups towards a shared end goal. In the words of Araya [35], interactivity among prosumers can be catalogued as follows: intervention by the user upon content, the transformation of the spectator into actor, individualized dialogue with connected services, and reciprocal actions. These elements can be grouped into a series of principles that describe interactivity as inherent to the form of social communication, especially among prosumers and users. The first principal can occur through participation and intervention as something beyond mere opinion, when practices and contents are modified through the inclusion of prosumer experiences, bringing with them multidirectionality or the principle of hybridization [35], which converges on the actions of emission and reception in a co-construction of messages with shared sense and meaning. Finally, the principle of exchange and promotion can be characterized as the ability to consolidate communication networks to transform meaning through new contents as a product of exchange, association, and free expression.

The prosumer is empowered, another characteristic dimension of the prosumer, calling forth an action of empowerment whose intrinsic value lies in the defense of rights (Sánchez & Contreras, 2012) [36], of values, and of respect for citizen action to transform their environment and improve quality of life. The common citizen, the expert, the professional, and even people with limitations are capable of transforming and bringing forth sociocultural development. Consequently, the change in role from simple recipient should be gradual, such that one's creative participation is central in defining freedom of expression and intervention in detrimental features of ethical, political, and aesthetic dynamics. Prosumers are empowered whenever they create, construct, and innovate, leaving aside the original role of waiting to receive that which is produced by others. Now, this polymorphism gives everyone the possibility of motivating or creating something but not something isolated or the result of individual effort, given that the prosumer is only one in a set of prosumers. Thus, one cannot refute that which one does not know; this is the old adage that opens the path to the empowerment of the prosumer, who, beyond producing, provides initiatives for others to do something for change.

For the prosumer and his or her educational action referred to in this study, the master key for change towards an autonomous pedagogical model facilitated by associated pedagogical perspectives is held by the teacher because teachers guide the reflective transition and the priority of involving the educand in the design of educational processes. For this reason, the teacher is the actor who gives the possibility of effecting changes, opening up to different positions, and attributing meanings to collaborative creations, without losing sight of the curricular and institutional goals

designated by the university or training program. Thus, "pedagogy based on that disposition towards co-authorship and interactivity implies the termination of one model of teacher and the birth of another in which the teacher is democratic and expansive in outlook" [37].

For learning in this style, a change in the positioning of the teacher is essential because he or she goes from being the central axis to the idea that the entire group is needed to motivate and bring the educand closer to a creative, flexible, and reflexive process through interaction and the communicative opportunities offered by ITC. This vision of the teacher is translated into student prosumers; more than recipients and consumers of information, they become people who produce meaning to connect interests, problems, and uncertainties that are representative of the reality constructed by the cultural, cognitive, and behavioral mediations experienced in everyday life.

This educational paradigm, aimed at learning and not at teaching, has gained strength through the implications of ITC, more precisely due to the rise in the social web, thus leading to new thinking on the forms and practices of the teacher in the higher education setting. In relation to the above and interpreting what Salinas [38] has stated, the following student-teacher interactions can be distinguished in prosumer situations: modifications in learning resources, the active involvement of the student, individualized experiences, collaborative experiences, and problem-solving.

By learning simultaneously, teachers and educands, meta-learning becomes a form of approaching knowledge, a fundamental aspect of higher education that, strengthens the design of curricula constructed by pairs and among pairs to modulate educational processes that are connected to students' experiences and outcomes. In this vein, the impact of the invisible economy or of knowledge projects onto higher education some education obligations that are more reflexive and critical and that represent diversified ways of change-based learning positions, which constructivism has not been able to reach and where competencies begin to make incursions without any positive traces.

In the second part of the results and discussion, the transformation of teacher competencies is presented. Much of what is involved in changing teacher attitudes and aptitudes in pedagogical contexts based on b-learning education has to do with development by competencies. These are shown through specific studies on "changes in concepts of learning" that have been conducted by UNESCO. Competencies can be defined as abilities or prospects of interaction and behavior for the implementation of knowledge [39].

In this dialogic order of educational ideas, efforts should be directed towards generating the competencies of the teacher-prosumer and any knowledge worker who wants to participate in the "educational revolution" focused on aspects such as teaching values for participation that allows citizens to grow as individuals and as a society, multimedia [40], gamification (game-based learning), creativity, data analysis (augmented learning), the organization of collective intelligence and digital intuition: methodologies, tools for "giving meaning." In summary, all of these aspects are for significantly developing competencies for web-based learning.

In this world transformed by the aforementioned scenarios, there is space for a painstaking review of the competencies that the prosumer should acquire, just as the IFTF [41], Reig [42], and Casap [43] propose similar abilities that should be developed to create new professions. Beginning with expertise developed over the course of this study and in accordance with the discussions of Reig and Casap (Table 1) shows the transformation of teacher competencies in b-learning contexts, which are then absorbed through contexts of change and lead to new teacher-prosumer competencies:

b-learning teaching competencies	Contexts of change	Teacher-prosumer competencies
Pedagogical	Social web Augmented society Learning technologies Empowerment technologies Intelligent systems Computational world	Virtual collaboration
Disciplinary		Transcultural
Didactic		New media literacy
AVA design		Design-oriented mentality
Socio-communicative		Cognitive load management
Technological		Social intelligence
Content creation and organization		Adaptive thinking
		Decision-making
		Computational thinking

Table 1. Transformation of b-learning teacher competencies to the teacher-prosumer

1. Giving meaning is the capacity to determine the meaning of what is being expressed. With technological development, machines are taking over the capacity of memory, routine manufacturing, and the employment of services; thus, there will be a growing demand for the abilities in which machines are not effective, those high level abilities that cannot be codified by machines, the so-called sensorial abilities for decisions, and the abilities that help create a unique vision that are fundamental for decision-making. Giving meaning is the ability that allows the world to be understood when it becomes intangible in some manner. This occurs when the environment is rapidly changing, presenting surprises that one is not prepared for or when facing adaptation problems rather than technical issues to be solved. [44].

2. Social intelligence is the ability to connect with others in a deep and direct manner, to detect and stimulate desired reactions and interactions. In a social manner, intelligent employees are capable of quickly evaluating the emotions of those around them and adapting their words, tone, and gestures. This will always be a key ability of educators; it is necessary to collaborate and construct relationships of trust, but it is even more important to collaborate with large groups of people in different contexts. Emotionality and social intelligence have been developed over millennia in groups, which represents a comparative advantage over machines. Social intelligence broadens the range of action of emotional intelligence; going beyond one person, it refers to the capacities that the individual develops together with two or more people: It is what occurs when they connect, opening new spaces and branches of medicine to study these social interactions. This is the case of social neuroscience, a discipline charged with analyzing the relationships between the brain and social behavior [45].

3. Original and adaptive thinking is the ability to think and find solutions and answers beyond what is dictated by memory

or pre-established paths expresses, intuition, flexibility, observation, and change, permanent beta, etc.). Adaptable thinking is centered on training in “how to think instead of what to think.” Adaptive thinking is different from lateral, creative, or out-of-the-box thinking; it is defined by the conditions in which it is produced, the conditions or limitations that should be taken into account to generate a solution sought from within. In this study, adaptive thinking is defined as a set of abilities that involve negotiation and consensus-seeking, the capacity for effective communication, analyzing ambiguous situations, using abilities to resolve creative problems – in summary, to empower critical thinking. The need to promote adaptive thinking that promotes innovation turns the teacher into an apprentice; it allows going beyond preconceived notions formed by experience in the comfort zone and recognizes testing and responding to complex and changing situations with greater flexibility.

4. Transcultural competencies are the ability to operate in different cultural environments (it is necessary to employ the role of the anthropologist in social media). In a globally-connected world, it is necessary to generate a set of abilities to be able to operate in any environment in which one finds oneself. Doing so requires specific content, not only linguistic abilities but also the capacity to adapt to changing circumstances and the capacity to detect and respond to new contexts.

5. Computational thinking is the ability to translate large quantities of data into abstract concepts and to understand data through reasoning. It is also related to intuition, flexibility, observation, and change, in permanent beta. It is the process of change that is involved in formulating problems and solutions so that they are represented to be efficiently performed in an information processing system.

6. New media literacy, or media literacy, is the capacity to critically evaluate and develop content that uses new forms of communication and to take advantage of media for persuasive communication with regard to format but especially with regard to the interactive social character that approaches the traditional social sciences. For centuries, literacy has referred to the ability to read and write; now, the majority of information emerges from a system of technologies interwoven with media. The capacity to read many forms of media has become an essential ability in the 21st century. Media literacy is the capacity to access, analyze, evaluate, and create media.

7. According to Rheingold [46], transdisciplinarity goes beyond bringing together researchers from different disciplines to work together on multidisciplinary teams. It means educating researchers who can speak the language of multiple disciplines—biologists who understand mathematics and mathematicians who understand biology.

8. The design mindset is the capacity to envision, represent, and develop work tasks and processes to obtain the desired results. Sensors, communication tools, and the processing power of the computational world will bring with them new opportunities to adopt a design focus in our work. Future teachers will need to become experts in recognizing the type of thinking required by different tasks and to make adjustments in the work environments that they wish to improve. This type of thinking is centered on the process

instead of the product. Put another way, it is centered on problem-solving, but it does not begin with any particular solution in mind; it is a balancing act between logic and the creative aspects of problem-solving. A process of logical thinking works well when we have existing knowledge to build upon, whereas a creative thinking process is required to create new understandings and to construct problems in a different manner from what has been done before.

9. It is important to manage the cognitive load, understood as the capacity to discriminate and filter information in order of importance and to understand how to maximally take advantage of cognitive functioning by using a variety of tools and techniques (from the documentarian to the content “curator” to productivity experts). A world that is rich in information flows in multiple ways and from multiple devices, bringing the issue of cognitive overload to the forefront. Sometimes, learning implies great effort, even cognitive suffering. The reason is that working memory is very vulnerable to the overload created by studying and performing increasingly more tasks. Therefore, cognitive load refers to the total quantity of mental activity imposed on working memory in a moment. The cause of the excess demand on working memory comes from the great quantity of new information emitted by different information systems, beyond what a person can process.

10. Virtual collaboration is the capacity to work productively, maintaining commitment, and demonstrating presence as a member of a virtual team. ITCs make it easier than ever to work, share ideas, and be productive despite physical separation. However, the virtual work environment also requires a new set of competencies. As the leader of a virtual team, teachers need to develop strategies to involve and motivate a group. One lesson is that techniques that are borrowed from games are extremely efficient in the participation of large virtual communities (gamification and serious games). The members of AVA also must become experts in the search for environments that promote productivity and well-being.

VII. CONCLUSIONS

One of the main problems when involving the figure of the prosumer in the context of higher education is the persistent industrial model of education founded on the transmissionist paradigm that prolongs specialized technical-technological training more in line with the demands of consumption and the axiom of factory production implied within a transfer culture instead of a transformation culture. In this sense, universities, their methodologies, and pedagogical discourses are circumscribed within a prevailing notion of the work of the teacher wherein the educand acts passively in the classroom without any consideration given to dialogue. Similarly, the impact of ITC has been relegated to furthering this paradigm, using its conceptual and practical tools to favor unidirectional communication and an interaction biased towards the precepts of an educational community that is reluctant to accept the possibilities of change through a critical and reflexive stance vis-à-vis the use of ITC.

It is demonstrated that the interest to know and make known the development and research progress is high, however the knowledge of the tools that allow the dissemination and knowledge of the scientific works in the network are minimal.

There is no training or mapping that illustrates the usefulness of e-research tools in university and postgraduate research.

The tutors and teachers, agents in charge of guiding the scientific training process of the students, are not technically trained in the e-research processes, they do not even know the tools or the access routes for it.

Although the most relevant aspects in the research processes are: the dissemination of results and the support of networks, the research processes analyzed remain individual and closed. It seems that the lack of knowledge of the functionalities of the tools has a direct impact on the interest of scientific dissemination.

Despite the inclusion of new and better online research tools, the research continues to be developed with traditional methods, with unreliable programs which generates lack of reliability in the results.

Elements of open knowledge are used by some experts what generates a closed group or an elite community, whose hermetic characteristic hinders the research process.

Given the evidence of the low production of knowledge by teachers and the multiple contributions of ICT to research work, it is a priority to promote awareness of the advantages that exist between the research-teaching relationship, in giving solid training guidelines in research to current and future teachers, and in involving all the strategies and instruments that facilitate ICTs for this work proper to the emerging figure of the prosumer teacher.

One of the main problems when involving the figure of the prosumer in the context of higher education is the persistent industrial model of education founded on the transmissionist paradigm that prolongs specialized technical-technological training more in line with the demands of consumption and the axiom of factory production implied within a transfer culture instead of a transformation culture. In this sense, universities, their methodologies, and pedagogical discourses are circumscribed within a prevailing notion of the work of the teacher wherein the educand acts passively in the classroom without any consideration given to dialogue. Similarly, the impact of ITC has been relegated to furthering this paradigm, using its conceptual and practical tools to favor unidirectional communication and an interaction biased towards the precepts of an educational community that is reluctant to accept the possibilities of change through a critical and reflexive stance vis-à-vis the use of ITC.

Thinking with the communicative action of the prosumer is incoherent with the culture of “recycling” media held by educational institutions in which there are diverse methods of accessing information and giving an interpretive value through digital literacy. Conversely, this recycling culture is used to create a bifurcation in formality, one that demonizes the discourse of media technologies and their noxious effects on both teacher and educand concentration as well as the informal space used to explore different types of information. It is clear that without direction from the formal educational scenarios, it is not possible to acquire strategies and habits that accompany

metacognition as a cognitive, cultural, and attitudinal bridge between these two educational possibilities.

Specifically, one of the paths of change is based on the need to implement the social web and all its richness of information, interaction, and feedback in the task of education. However, the resources that are offered in this alternative are being used in a manner that is disconnected from the pedagogical, curricular, and educational perspectives that have emerged as new scenarios of discussion through lines of research. Thus, there is evidence of a lack of a coherent transition process in implementing the potential of the social web in the educational realm. Instead, the application of the social web has largely centered on generating virtual classrooms and virtual environments, with teacher participation as a central pillar and educands as receivers of information without the possibility of adapting or modifying the learning environment to support their own individualities and educational interests.

Educational institutions should adapt their models to the constant presence of technology and face the challenge of training teachers (in accordance with IFFT, 2001) in the development of abilities such as critical thinking, perspicacity, and analytical ability, the integration of new media for literacy in educational programs, including experiential learning that prioritizes social competencies such as the capacity to collaborate, work in groups, read social signals, and respond in an adaptive manner, promote the broadening or expansion of learning beyond adolescence and young adults to the age of adulthood, and integrate interdisciplinary training that allows students to develop abilities and knowledge in a broad range of topics.

The changes presented as results of this study suggest that there is a need to add more technological resources to what is being taught versus what is being learned. It is not very realistic to think that educational institutions are in danger of disappearing; on the contrary, it is necessary to rethink and to strengthen them, to permit change from the cognitive to the technological, from students to teachers, from the medium to the content. Educational and teaching institutions are called upon to be the motor of innovation, but innovation is not simply a technical question; rather, it is more about understanding how people and societies function, what they need and what they want. The adaptation of learning comes from reinvention and adaptation to situations. "America will not dominate the 21st century because of its manufacturing of cheaper computer chips but by reimagining how computers and other new technologies interact with human beings." This does not in any way represent a detriment to the need for technological training, but it suggests that as one works more with computational systems, the most valuable abilities will be those that are exclusively human, those that computers still cannot achieve.

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