Analysis of the development of educational competencies according to teaching modalities through the use of ICT

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Abstract
One of the main objectives of the convergence process within universities is that the design of study plans and teaching programs should be carried out taking student learning as a reference point. Hence, in the development of a plan, in addition to defining the contents of the training program, the procedures that will be applied in the development of the teaching-learning processes must specified to encourage the methodological change from teaching focused on the teacher's activity to another oriented to student learning. This implies that once the competencies to be developed by students in relation to an educational level are established, the next step is to design the activities that they must carry out to achieve knowledge as a result of this learning process. The design of a plan cannot be limited to the distribution of subjects and credits, but must specify the teaching methods that will allow an average student to achieve the proposed learning; that is to say, to specify the methods and methodologies of the teacher and the student that are considered appropriate according to the objectives. The purpose of this study is to define and characterize the main teaching methodologies based on the use of technologies that can be used in higher education, specifying the main activities and tasks to be developed by teachers and students for each of them.

Key words: Teaching models, Educational competencies, educational technologies.

1.Introduction

Teaching models are theorized structures used in the learning process by teachers at any level, whose purpose is to ensure that the student is able to acquire and apply new knowledge. These models seek to strengthen certain competencies in the students' learning process, with the purpose of providing them with a quality education that they can apply in their daily activities. Now, when talking about competence, it is valid to clarify that in the educational sector, it refers to know-how, or knowledge of execution that in certain circumstances ends up focusing the teaching process on the personal skills of each student taking into account their learning styles where cultural, social, professional, affective and other aspects converge (Argudín, 2001) .

The teaching process is so dynamic that it is not correct to state that one model or another will be more successful. Competency-based education takes into account the different human components that can be identified in the individual. Therefore, the principles of teaching cannot be understood as static dogmas but as a constant exchange of knowledge between the student and the teacher. However, it is possible to

establish which teaching models are currently in use, and which are not (Martínez Valcárcel, 2004) . However, it is possible to establish which teaching models are currently being used by teachers to share their knowledge with students, which will lead to answer the question: How are the teaching models based on ICT currently used at the university stage to enhance educational competencies?

2. General Objective

The main objective of the study is to define the characteristics of the most relevant competence-based teaching models used in higher education.

3. Teaching models based on the use of ICT.

As mentioned above, teaching models, far from being a rigid structure of strict compliance, tend to be flexible mechanisms that help identify learning styles in students in order for them to retain the greatest quantity and quality of information provided by the teacher.

Currently, due to technological progress and the search to cover more spaces in society, teaching models have been impacted by the use of ICT with tools created for optimizing the learning process through the digitalization of contents of different subject plans. In this way, for 2008, a teaching model known as MOOC (*Massive Open Online Course*) was proposed by Dave Cormirer and Bryan Alexander in Canada (Lopez-Meneses, Gomez-Galan, Bernal, & Vazques, 2020) in response to the demand in education and to the limits that at some points were imposed by geographical distances, as well as the technological growth or advancement to which education was not alien. As with any new tool, the professors of the different universities have been forced to modify their teaching methodology to take advantage of the different tools offered by the use of ICT.

The scope of ICTs in the university covers three areas: content, both in training and research; the teaching model and the organizational model, which is why it is important to measure the impact of ICTs in the university (Rodriguez, 2010) . It is therefore important to measure the impact of the proposed models on the education that students are receiving at the university. This is explained by the dynamism with which society is changing and migrating more and more to the virtualization of different processes, including of course learning, which controverts then with traditional teaching models based on the transmission and memorization of a set of data that when processed become vital information for the receiver. However, it should be noted that these models are applied without any distinction of the different learning styles, while in models such as MOOC the student is encouraged to develop their own skills and to obtain knowledge to be applied in different real scenarios under the objectives set by the teacher in the training of professionals who not only develop knowledge, but attitudes and skills of great value in an increasingly dynamic society.

3.1 Bibliographic analysis of the MOOC teaching model.

In order to know the impact and importance of the use of MOOC methodology, it is important to analyze the behavior of the research studies that have been carried out recently. To this end, many papers have been published in high impact journals indexed in the Scopus database during the period 2012-2020 without distinction of country of origin or area of knowledge, resulting in a total of 5,174 research papers that will be analyzed regarding the annual growth of the volume of production and the different areas of knowledge that are developing research based on the MOOC model.

3.1.1 Analysis of the annual growth in the volume of scientific production.

Figure 1 shows the growth of research papers published about the MOOC variable from 2012 to 2020.

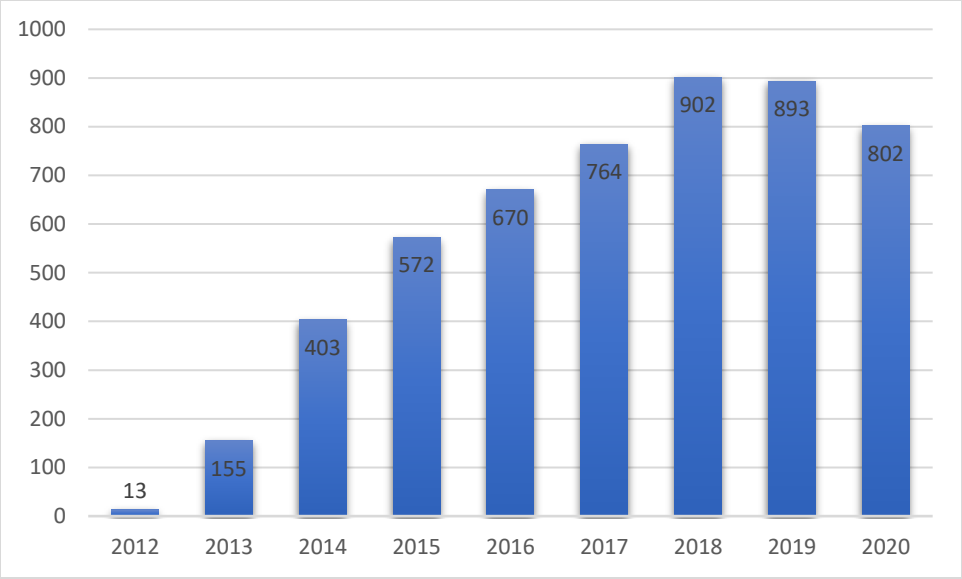

Figure 1. Distribution of papers by year of publication.
Source: Own elaboration (2021) based on data provided by SCOPUS.

A significant growth is observed between the years 2012 and 2018, the latter being the year where the highest scientific production was recorded with a total of 902 papers related to the MOOC teaching model. The most significant variation is presented between 2013 and 2014 where 155 and 403 researches were registered respectively. Among the 403 related publications in 2014, there is the conference paper titled "*How video production affects student engagement: An empirical study of MOOC videos"* (Guo, Kim, & Rubin, 2014). which show 666 citations, as the paper with the highest impact within the period of time studied in this research and whose main objective is to present the results of their study on the use of videos as support material in the virtualization of content under the MOOC methodology, and prove that students are more receptive to short videos showing that after playing these videos, students develop their online activities almost immediately, compared to long videos such as recorded classes or lectures where students quickly lose interest and attention. This shows that virtual tools are important elements in the new teaching methodologies and that teachers have also been training themselves to migrate their modality from the traditional one to that proposed by the MOOC.

3.1.2 Analysis of the participation of the different areas of knowledge in the production of research related to the MOOC modality.

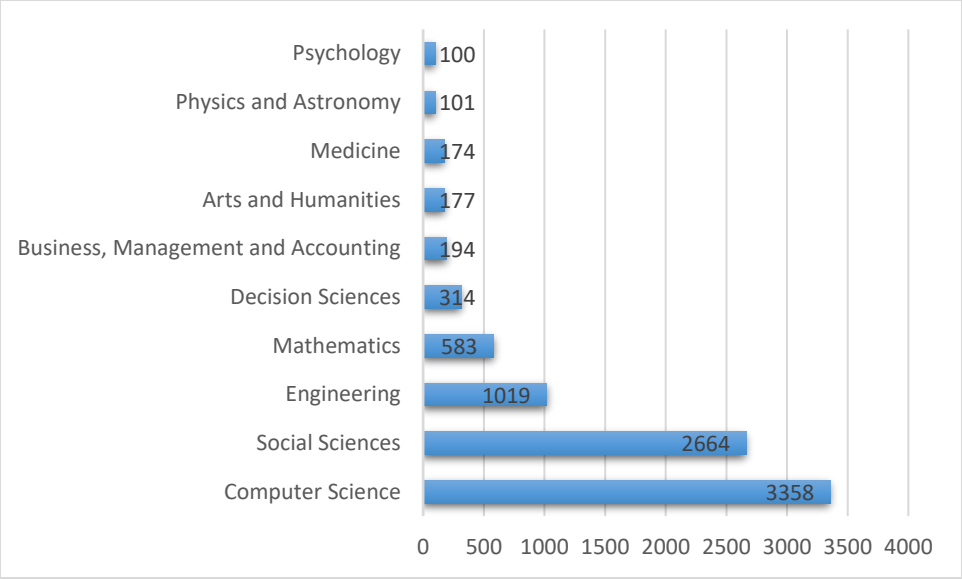

Figure 2. Distribution of papers by area of knowledge.
Source: Own elaboration (2021) based on data provided by SCOPUS.

Figure 2 shows the top ten categories in terms of the areas of knowledge that produce research papers using as a reference the MOOC variable as a methodology or teaching modality.

Computer sciences, lead the development of research in the mentioned variable with 36.2% of participation, i.e., a total of 3,358 research papers focused on the MOOC teaching modality, followed by social sciences with 2,664 and engineering with 1,019 papers, with 28.7% and 11% respectively. Among the papers registered by the social sciences, the paper titled *"MOOCs: A systematic study of the published literature 2008-2012"* stand out (Liyanagunawardena, Adams, & Williams, 2013) . This paper presents a systematic review of the MOOC literature published in the period 2008-2012 just in the period where this modality began to be implemented, so the importance of conducting a systematic analysis of the MOOC variable motivated these researchers so that their work would be used as a basis for the development of the following research. A proof of that is that it has been cited 588 times since 2013.

Likewise, the paper titled "*Initial trends in enrolment and completion of massive open online courses"*, by Jordan (2014), has been cited 588 times. Its main objective is to describe the rate of completion versus enrollment in virtual courses; its main finding was to demonstrate that from a total of 43,000 students who enroll in a virtual course, only 6.5% complete it. This is undoubtedly interesting for the design of strategies in higher education institutions to ensure permanence and reduce the dropout rate of students of virtual programs, showing that it is related to the time of duration of the same.

4. Competency-based education models.

At present, when the use in technology in society is growing faster and faster, companies are looking for professionals who meet increasingly specific requirements, unlike previous times where a professional diploma certifying training in certain areas was enough to start working life. Today companies are not only looking for training people, but for forming professionals with multiple skills, human quality, among other qualities that as an added value are offered by that professional who has been trained through an education based on competencies. Competencies in education are then understood as knowing how to execute an action and learn from experience, which generates a two-way learning process between knowledge and competence (Argudín, 2001) .

The new trends in education focus their strategies on teaching through the needs, learning styles and personal skills of the individual, and although it may seem difficult to achieve, this is where the tools of the new training modalities play a fundamental role in empowering the student's skills that will end up being the added value that he/she will deliver to the company where he/she will work as a professional.

4.1 Bibliographic analysis of education by competences.

In order to achieve the purpose of this research to describe and characterize the impact that teaching models have on competency-based education, it is also necessary to know how research on competency-based education is currently distributed among students.

The search for research papers is similarly done through the Scopus database, where they are filtered through the variable Education by Competencies, yielding a total of 21 documents in the period 2013-2020. The purpose of this analysis is to know the annual behavior of scientific production under this variable, as well as the areas of knowledge that deal with the topic of education by competences.

4.1.1 Analysis of the historical evolution of research works under the Education by Competences variable.

Figure 3 shows the behavior of scientific production in terms of papers published in high impact journals during the period 2013-2019.

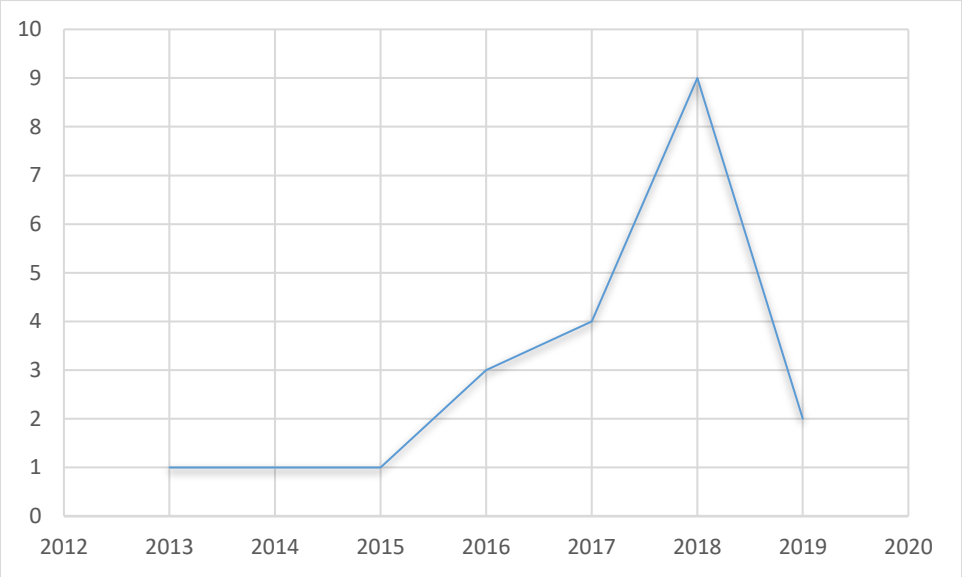

Figure 3. Distribution of papers by year of publication.
Source: Own elaboration (2021) based on data provided by SCOPUS.

The figure shows that during the first three years (2013, 2014 and 2015) there was only one research paper registered per year. On the other hand, the highest peak corresponds to the year 2018 with a total of 9 researches in total, within which the paper titled "*Analysis of current teachers training on ICTs' skills: Proposing a new perspective based on teachers' previous competences, experiences and skills"* (Beneyto-Seoane & Collet-Sabé, 2018) purposed to analyze why teachers, although highly qualified in the use of digital platforms, do not share this knowledge with their students, limiting themselves to the delivery of knowledge through traditional teaching models. The study proposes then, the creation of a new training model for teachers based on the experience and skills that they demonstrate so that the training does not go only unilaterally, but is a mutual learning between student and teacher. This research article has a total of 7 citations in different studies after its publication in 2018.

4.1.2 Analysis of the participation of the different areas of knowledge in the production of research on competency-based education.

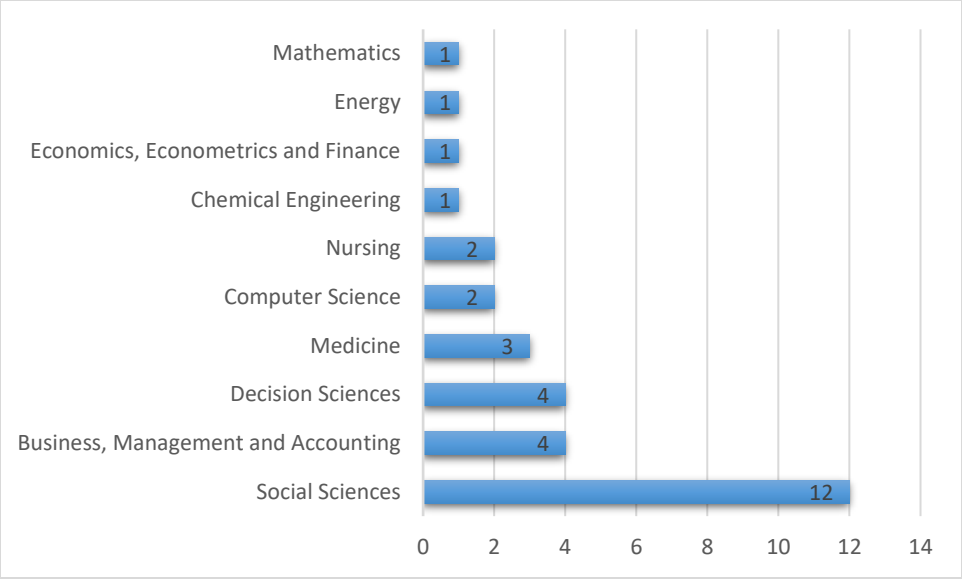

Figure 4. Distribution of papers by area of knowledge.
Source: Own elaboration (2021) based on data provided by SCOPUS.

Figure 4 shows the distribution of research papers by the area of knowledge through which they are developed. It should be noted that a research paper can handle one, two or more areas of knowledge, which is why the total number of papers shown in the previous figure does not coincide with the total number of papers related at the beginning of point 2 of this paper.

Social sciences lead the list with a total of 12 papers (36.4% of the total production) followed by Business, Management and Accounting and Decision Sciences with 4 papers each. Health areas also participate in the registry, such as Medicine and Nursing with 3 and 2 registered researches respectively, among which the paper titled "*3 or 4 years for anesthesia residency program? How to approach the discussion in terms of competency-based education"* (Olmos-Vega & Bonilla-Ramirez, 2017). which raises the possibility of changing the teaching model in anesthesiology specialty training, proposing precisely a competency-based teaching model and not a fixed time model. In other words, they propose that the duration of the training process should not be based on a time limit, but on the scope of the development of skills and competencies of the students.

Within the area of social sciences, as a group that represents the largest number of published studies, it is also important to highlight the article "*Investigating student exposure to competency-based education"* (Ryan & Cox, 2017) whose objective is to measure the impact that competency-based education has on students, applying tools for data collection with a population of 600 students concluding that the training process becomes more effective, potentiating students' competencies, through the analysis of the different learning styles.

5. Conclusions

To reach a conclusion after analyzing the characteristics and the impact that competency-based education has on the quality of the training of a professional through teaching modalities based on the use of ICT, it is sufficient to review the methodology that university teachers are currently implementing, as shown in the different scientific papers analyzed throughout this paper, as well as the interdisciplinarity that is evident in the participation of different sectors of the economy in the execution of strategies that pursue the training of professionals whose competencies and skills imply an efficient performance in the execution of tasks and obligations in the company, as well as in the constant search for personnel not only trained in learning but with human skills. But to reach that state where a professional achieves the ability to develop both knowledge and being, it is necessary to be trained under pedagogical strategies that allow them to make decisions within their process, as shown by the MOOC teaching model, since by training professionals

through digital media, it gives them the opportunity to develop virtues such as punctuality, responsibility, honesty and others, since in many cases the free courses lack a strict compliance with an established schedule.

Finally, it is concluded that the competency-based model arises in society thanks to the need to respond to the different challenges that globalization imposes on a group of companies and organizations that struggle to position and expand their share in a market flooded with increasingly demanding consumers who expect to satisfy as many needs as possible with the minimum investment, Likewise, users or customers in the education sector decide in which institution they prefer to be trained according to what it offers them in response to the needs that the future professional demands, and the truth is that the experience is increasingly closer to knowledge when its application is based on the development of human skills and abilities that make the student a professional capable of responding to any challenge in the business sector.

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